MicroMaxx™
Ultrasound System
Service Manual

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Chapter 5: Cleaning and Disinfecting

Chapter 6: Troubleshooting

Chapter 7: Replacement Procedures

Chapter 8: Performance Testing

Chapter 1: Introduction

Before servicing the MicroMaxx ultrasound system, please read the information in this manual. This text applies only to the SonoSite MicroMaxx ultrasound system product manufactured after June 1, 2005. Please find service information about products manufactured before June 1, 2005 in *C1.51 Ultrasound System Service Manual (P00715), C1.75 Ultrasound System Service Manual (P01118), C1.9 PLUS Ultrasound System Service Manual (P02287), C1.99 PLUS and ELITE Ultrasound System Service Manual (P02913)*, and *TITAN Ultrasound System Service Manual (P03309)*.

Audience

The intended audience of this manual is properly trained field and in-house service personnel.

Conventions Used in This Service Manual

These conventions are used in this service manual:

- A **WARNING** describes precautions necessary to prevent injury or loss of life.
- A **Caution** describes precautions necessary to protect the products.
- When the steps in the operating instructions must be performed in a specific order, the steps are numbered.
- Bulleted lists present information in list format, but they do not imply a sequence.
- The system handle is on the front of the system, and the battery compartment is on the back of the system.

Product Upgrades and Updates

SonoSite may offer software upgrades and new features that may improve system performance. Service manual updates, explaining the effects of upgrades and new features on system performance, will accompany the upgrades.

Customer Comments

Questions and comments are encouraged. SonoSite is interested in your feedback regarding the service manual. Please call SonoSite at **1-877-657-8118**. If you are outside the USA, call the nearest SonoSite representative. You can also send electronic mail (e-mail) to SonoSite at the following address:

service@sonosite.com

About the System

The ultrasound system has multiple configurations and feature sets. All are described in this service manual but not every option may apply to your system. System features are dependent on your system configuration, transducer, and exam type.
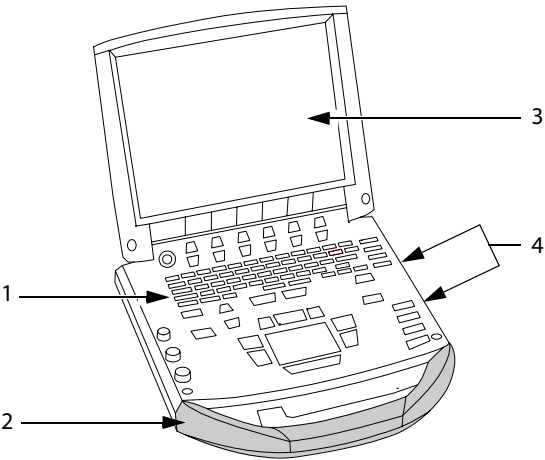
Figure 1.1 MicroMaxx System Front View

Table 1.1: MicroMaxx System Front Features

Number	Feature
1	Control panel
2	Handle
3	Display
4	CompactFlash® slots (front for image storage, back for system and transducers updates, import/export OB tables, user names/passwords, and DICOM configurations)
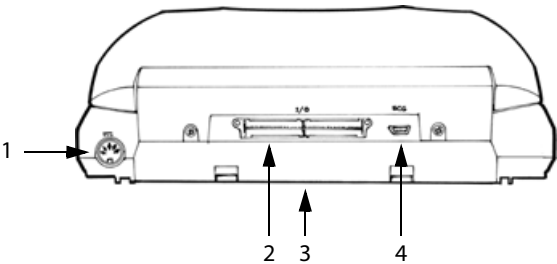
Figure 1.2 MicroMaxx System Rear View

Table 1.2: MicroMaxx System Rear Connectors

Number	Feature
1	DC input connector
2	I/O connector
3	Battery
4	ECG connector

The system is a portable, software-controlled, ultrasound system using all-digital architecture. The system is used to acquire and display high-resolution, real-time ultrasound images: 2D, color power Doppler (CPD), Color Doppler (Color), Tissue Harmonic Imaging (THI), M Mode, pulsed wave (PW) Doppler, and continuous wave (CW) Doppler. The system has a cine buffer, pan zoom, labeling, biopsy, measurements, calculations, a connection for image transfer, image and clip storage, image review, printing, recording, the ability to archive Doppler with audio output to a videotape, and DICOM connectivity.

Currently, the system supports the following broadband transducers:

- C60e/5-2 MHz 60 mm curved array
- HFL38/13-6 MHz 25 mm linear array
- ICT/8-5 MHz 11 mm intracavitary array
- L38e/10-5 MHz 38 mm linear array
- P17/5-1 MHz 17 mm phased array
- TEE/8-3 MHz phased array

System accessories include the following: mobile docking system (MDS), MDS Lite, mini-dock, Triple Transducer Connect, a power supply, a battery, ECG cable, video and printer cables, and SiteLink Image Manager 3.0 software. See the applicable SonoSite accessory user guide for information on the accessories.

System peripherals include medical grade (conforming to the requirements of EN60601-1) and non-medical (commercial) grade products. System medical grade peripherals include a printer, VCR, and DVD. System non-medical grade peripherals include a CompactFlash card and a Kensington Security Cable. System setup instructions for the use of peripherals are covered in the *MicroMaxx Ultrasound System User Guide*.

Manufacturer's instructions accompany each peripheral. Instructions for the use of peripherals with the system are covered in the applicable SonoSite accessory user guide.

About the System Software

The ultrasound system contains software that controls its operation. A software upgrade may be required for new feature releases. Should an upgrade be required, SonoSite will provide you with a CompactFlash card containing the software. A single CompactFlash card can be used to update one or more systems. Software upgrades use the back CompactFlash slot on the right hand side of the system. CompactFlash cards installed in the front CompactFlash slot do not upgrade the system.

Software Licensing

SonoSite software is controlled by a license key, which is obtained from SonoSite or from its authorized representatives. You must obtain one key for each system or transducer that will use the new software. See .

The software may be installed and will operate for a short period of time without requiring a valid license key. We refer to this period of time as the "grace period." The grace period is variable.

When you first install your software, your SonoSite system prompts you for a license key. If you have not yet obtained a valid license key, you can elect to use the software as long as the grace period time has not been fully consumed.

When a system is running in the grace period, all system functions are available. As you use the system, the grace period is slowly consumed. When the grace period has expired, the system will not be usable until a valid license key has been entered. Grace period time is not consumed while the system is powered off or when it is in "sleep" mode. Whenever a system is running in the grace period, the grace period time remaining is available on the license update screen.

Caution: When the grace period expires, all system functions except for licensing are unavailable until a valid license key is entered into the system.

Chapter 1: Introduction

Chapter 2: Safety

Read this information before using the ultrasound system. The information in this manual applies to the ultrasound system, transducer, accessories, and peripherals. This chapter contains safety information.

A **WARNING** describes precautions necessary to prevent injury or loss of life.

A **Caution** describes precautions necessary to protect the products.

Electrical Safety

This system meets EN60601-1, Class I/internally-powered equipment requirements and Type BF isolated patient-applied parts safety requirements.

This system complies with the applicable medical equipment requirements published in the Canadian Standards Association (CSA), European Norm Harmonized Standards, and Underwriters Laboratories (UL) safety standards. See the *MicroMaxx Ultrasound System User Guide*, Specifications chapter.

For maximum safety observe the following warnings and cautions.

WARNING: To avoid discomfort or minor risk of patient injury, keep hot surfaces away from the patient.

Under certain circumstances, the transducer connector and back of the display enclosure can reach temperatures that exceed EN60601-1 limits for patient contact, therefore only the operator shall handle the system. This does not include the transducer face.

To avoid discomfort or minor risk of operator injury when handling the transducer connector, the system should not be operated for more than 60 minutes continuously in a live-scan mode (as opposed to freeze or sleep modes).

To avoid the risk of electrical shock or injury, do not open the system enclosures. All internal adjustments and replacements, except battery replacement, must be made by a qualified technician.

To avoid the risk of injury, do not operate the system in the presence of flammable gasses or anesthetics. Explosion can result.

To avoid the risk of electrical shock, use only properly grounded equipment. Shock hazards exist if the power supply is not properly grounded. Grounding reliability can only be achieved when equipment is connected to a receptacle marked "Hospital Only" or "Hospital Grade" or the equivalent. The grounding wire must not be removed or defeated.

To avoid the risk of electrical shock, before using the transducer, inspect the transducer face, housing, and cable. Do not use the transducer if the transducer or cable is damaged.

To avoid the risk of electrical shock, always disconnect the power supply from the system before cleaning the system.

To avoid the risk of electrical shock, do not use any transducer that has been immersed beyond the specified cleaning or disinfection level. See the *MicroMaxx Ultrasound System User Guide*.

To avoid the risk of electrical shock and fire hazard, inspect the power supply, AC power cord, and plug on a regular basis. Ensure they are not damaged.

To avoid the risk of electrical shock, use only accessories and peripherals recommended by SonoSite, including the power supply. Connection of accessories and peripherals not recommended by SonoSite could result in electrical shock. Contact SonoSite or your local representative for a list of accessories and peripherals available from or recommend by SonoSite.

To avoid the risk of electrical shock, use commercial grade peripherals recommended by SonoSite on battery power only. Do not connect these products to AC mains power when using the system to scan or diagnose a patient/subject. Contact SonoSite or your local representative for a list of the commercial grade peripherals available from or recommended by SonoSite.

WARNING:	To avoid the risk of electrical shock, inspect cables and power cords used within the system on a regular basis for damage.
	To avoid the risk of electrical shock to the patient/subject, do not touch the system battery contacts while simultaneously touching a patient/subject.
	To prevent injury to the operator/bystander, the transducer must be removed from patient contact before the application of a high-voltage defibrillation pulse.
	To avoid possible electrical shock or electromagnetic interference, verify proper operation and compliance with relevant safety standards for all equipment before clinical use. Connecting additional equipment to the ultrasound system constitutes configuring a medical system. SonoSite recommends verifying that the system, all combinations of equipment, and accessories connected to the ultrasound system comply with JACHO installation requirements and/or safety standards such as AAMI-ES1, NFPA 99 OR IEC Standard 60601-1-1 and electromagnetic compatibility standard IEC 60601-1-2 (Electromagnetic compatibility), and are certified according to IEC Standard 60950 (Information Technology Equipment (ITE)).
Caution:	Do not use the system if an error message appears on the image display: note the error code; call SonoSite or your local representative; turn off the system by pressing and holding the power key until the system powers down.
	To avoid increasing the system and transducer connector temperature, do not block the airflow to the ventilation holes on the side of the system.

Equipment Safety

WARNING:	To avoid the risk of a burn hazard, do not use the transducer with high frequency surgical equipment. Such a hazard may occur in the event of a defect in the high frequency surgical neutral electrode connection.

To protect your ultrasound system, transducer, and accessories, follow these precautions.

Caution:	Excessive bending or twisting of cables can cause a failure or intermittent operation.
	Improper cleaning or disinfecting of any part of the system can cause permanent damage. For cleaning and disinfecting instructions, see the *MicroMaxx Ultrasound System User Guide*.
	Do not submerge the transducer connector in solution. The cable is not liquid-tight beyond the transducer connector/cable interface.
	Do not use solvents such as thinner or benzene, or abrasive cleaners on any part of the system.
	Remove the battery from the system if the system is not likely to be used for some time.
	Do not spill liquid on the system.
	Accessible metal of the mini-dock is not protectively earthed. Do not perform high current grounding impedance test involving this part.

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Battery Safety

To prevent the battery from bursting, igniting, or emitting fumes and causing personal injury or equipment damage, observe the following precautions.

WARNING:	The battery has a safety device. Do not disassemble or alter the battery.
	Charge the batteries only when the ambient temperature is between 0° and 40°C (32° and 104°F).
	Do not short-circuit the battery by directly connecting the positive and negative terminals with metal objects.
	Do not heat the battery or discard it in a fire.
	Do not expose the battery to temperatures over 60°C (140°F). Keep it away from fire and other heat sources.
	Do not charge the battery near a heat source, such as a fire or heater.
	Do not leave the battery in direct sunlight.
	Do not pierce the battery with a sharp object, hit it, or step on it.
	Do not use a damaged battery.
	Do not solder a battery.
	The polarity of the battery terminals are fixed and cannot be switched or reversed. Do not force the battery into the system.
	Do not connect the battery to an electrical power outlet.
	Do not continue recharging the battery if it does not recharge after two successive six hour charging cycles.
	If the battery leaks or emits an odor, remove it from all possible flammable sources.

Caution:	To avoid the battery bursting, igniting, or emitting fumes from the battery and causing equipment damage, observe the following precautions:
	Do not immerse the battery in water or allow it to get wet.
	Do not put the battery into a microwave oven or pressurized container.
	If the battery emits an odor or heat, is deformed or discolored, or in any way appears abnormal during use, recharging or storage, immediately remove it and stop using it. If you have any questions about the battery, consult SonoSite or your local representative.
	Store the battery between -20°C (-4°F) and 60°C (140°F).
	Use only SonoSite batteries.
	Do not use or charge the battery with non-SonoSite equipment. Only charge the battery with the system.

Biological Safety

Observe the following precautions related to biological safety.

WARNING: Non-medical (commercial) grade peripheral monitors have not been verified or validated by SonoSite as being suitable for diagnosis.

Do not use the system if it exhibits erratic or inconsistent behavior. Discontinuities in the scanning sequence are indicative of a hardware failure that must be corrected before use.

Do not use the system if it exhibits artifacts on the LCD screen, either within the clinical image or in the area outside of the clinical image. Artifacts are indicative of hardware and/or software errors that must be corrected before use.

Some transducer sheaths contain natural rubber latex and talc, which can cause allergic reactions in some individuals. Refer to 21 CFR 801.437, User labeling for devices that contain natural rubber.

Perform ultrasound procedures prudently. Use the ALARA (as low as reasonably achievable) principle and follow the prudent use information concerning MI and TI.

SonoSite does not currently recommend a specific brand of acoustic standoff. If an acoustic standoff is used, it must have a minimum attentuation of .3dB/cm/MHz.

Some SonoSite transducers are approved for intraoperative applications if a market-cleared sheath is used.

Labeling Symbols

Labeling symbols for SonoSite products can be found in the user guide for each product.

Chapter 3: System Overview

System Overview

The SonoSite High-Resolution Ultrasound System (MicroMaxx) is a full featured, general purpose, software controlled, diagnostic ultrasound system used to acquire and display high-resolution, real-time ultrasound data in 2D, M-Mode, Pulsed Wave (PW) Doppler, Continuous Wave (CW) Doppler, Color Power Doppler, and Velocity Color Doppler or in a combination of these modes.

The System has an electrocardiography (ECG) display feature and supports a 3-lead ECG cable assembly to collect data for M-mode and Doppler measurements. The System provides measurement capabilities for anatomical structures and fetal biometry that provide information used for clinical diagnostic purposes. The System has a PW and CW Doppler audio output feature and cine review, image zoom, labeling, biopsy, measurements and calculations, image storage and review, printing, and recording capabilities.

The system includes the ability to measure the intima-media thickness (IMT) of the carotid artery using digital ultrasound images.   The IMT measurement of the carotid artery may be used adjunctively with other medical data obtained by a physician to help assess the cardiovascular health of a patient.

The system includes Digital Imaging and Communications (DICOM) capabilities as well as general computer communication capabilities to provide the acceptance, transfer, display, storage, and digital processing of ultrasound images and loops.   Security support is also provided to facilitate HIPAA compliance.

The System/Transducer is capable of exceeding a TI or an MI of 1.0 in certain operating modes or mode combinations. The System monitor displays the current output level in terms of one of two bioeffects indices ("Mechanical Index [MI]" and "Thermal Index [TI]") in accordance with the *AIUM/NEMA Standard for Real Time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment*.

Theory of Operation

The SonoSite High-Resolution Ultrasound System (MicroMaxx) has seven (7) major functional groups:

- Transducer
- Acquisition Subsystem
- Processing Subsystem
- Display Subsystem
- Control Subsystem
- User Interface Subsystem
- Power Subsystem

Figure 3.1 is a system block diagram that shows the relationship of the functional groups.
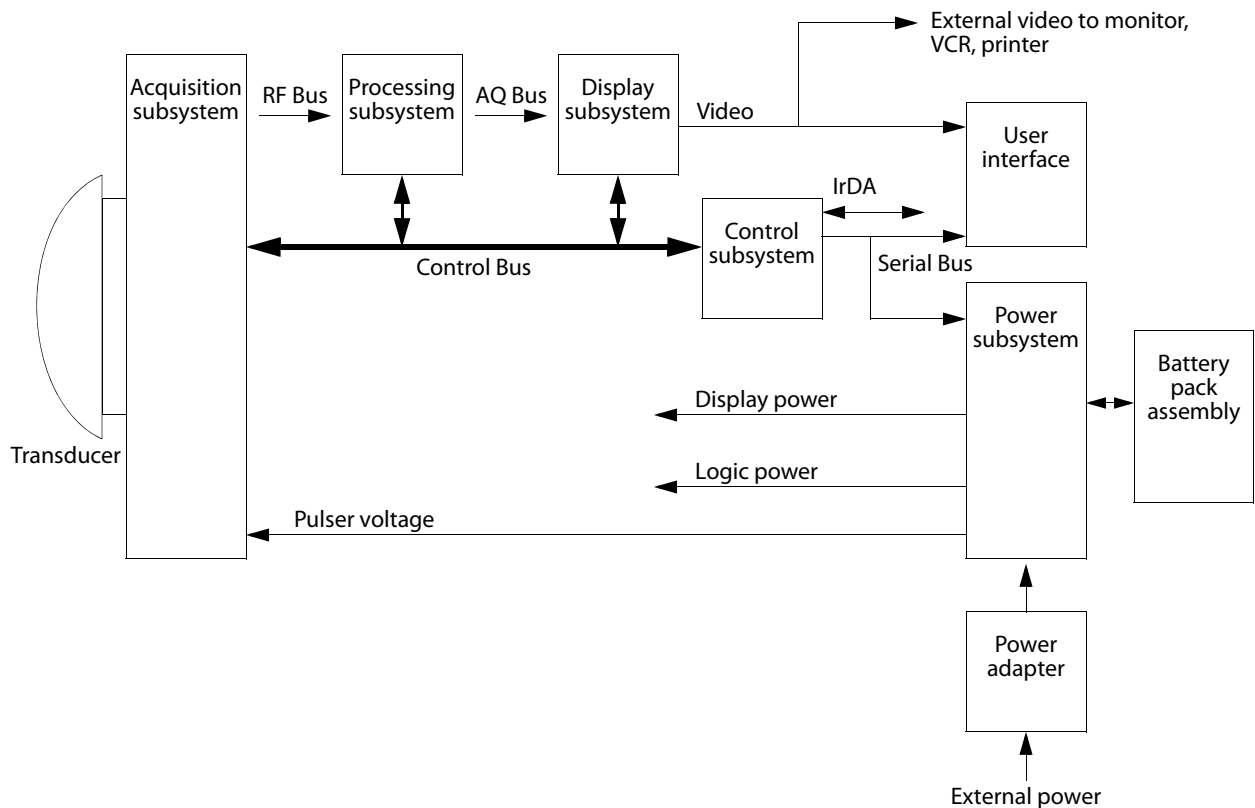
Figure 3.1 SonoSite High-Resolution Ultrasound System (MicroMaxx) Block Diagram

The **Transducer** elements convert the pulser voltage to acoustic energy during the transmit portion of the ultrasound acquisition cycle. The elements convert the acoustic echo to voltage in the receive portion of the acquisition. The voltage developed on the transducer elements is sensed by the acquisition subsystem. The system transducers have 64 to 128 elements.

The **Acquisition Subsystem** consists of the beamformer and interface to the transducer. The beamformer times the transmit pulses to focus the acoustic beam. The beamformer amplifies the low-level echo signal and times the receive information to focus the receive information. The system beamformers up to 64 transmit elements and 64 receive elements.

The **Processing Subsystem** includes capabilities for interfacing with the beamformer and performing high speed processing. The processing subsystem demodulates, filters, detects, and compresses the signal supplied by the beamformer into display information.

The **Display Subsystem** converts the detected ultrasound data into picture elements (pixels). The software user interface graphics are combined with the ultrasound information and converted to a video stream. The external video port supports NTSC and PAL format.

The **Control Subsystem** consists of the central processing unit, program and video memory, permanent image storage and retrieval memory, external communication interface ports, and connection to the user interface keys. The control software includes the acoustic power and intensity software subsystem, power group monitors, and a beamformer monitor. This software guarantees a level of patient safety by ensuring the system is operating within acoustic power and intensity limits.

The **User Interface Subsystem** represents the software interface and form factor. The software interface is the interaction between the user and the screen layout components. The form factor is the type of physical buttons, location, and grouping of the buttons and the device size, shape, and weight. Dedicated controls are for high usage activities and grouped according to the user workflow.

The **Power Subsystem** provides the system power and protects the hardware from destructive and/or unsafe conditions by detecting failures in the system through hardware and software monitors. Detection of a fault results in disabling of the pulser supply, and signaling of an error to the Control Group. The power subsystem includes the battery pack and battery charging electronics.

Description of Operating Modes

2D Mode	2D mode is a two dimensional image of the amplitude of the echo signal. It is used for location and measurement of anatomical structures and for spatial orientation during operation of other modes. In 2D, a two-dimensional cross-section of a 3-dimensional soft tissue structure such as the heart is displayed in real time. Ultrasound echoes of different intensities are mapped to different gray scale or color values in the display. The outline of the 2D cross-section may be a rectangle, parallelogram, trapezoid, sector, or a full circle, depending on the particular transducer used. 2D mode can be used in combination with any other modes.
M Mode	"M Mode" is also known as "T-M mode" or "time-motion" mode. It is used primarily for cardiac measurements such as valve timing and septal wall thickness when accurate timing information is required. Ultrasound echoes of different intensities are mapped to different gray scale values in a scrolling display. M Mode displays time motion information of the ultrasound data derived from a stationary beam. Depth is arranged along the vertical axis with time along the horizontal axis. M Mode can be used alone but is normally used in conjunction with a 2D image for spatial reference. The 2D image has a graphical line (M-line) superimposed on the 2D image indicating where the M Mode beam is located.
Color Power Doppler (CPD)	In CPD, a real-time two-dimensional cross-section of blood flow is displayed. The 2D cross-section may be presented as a rectangle, parallelogram, trapezoid, sector, or a full circle, depending on the particular transducer used. The 2D cross-section is presented as a full color display, with various colors being used to represent the power in blood flow echoes. Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the gray scale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display CPD, gray scale (echo) information or a blended combination is based on the relative strength of echoes from the soft-tissue structures and from the red blood cells. A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures. Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. The power in the remaining signal after wall filtering may be averaged over time (persistence) to present a steady state image of blood flow distribution.

Continuous Wave (CW) Doppler	CW provides a real-time representation of blood flow and is displayed as a velocity-versus-time sweeping output. Velocity (or frequency) is presented as the vertical axis with time along the horizontal axis. The magnitude of the detected signal is represented as different gray scale values.
	CW Doppler mode provides the clinician with the ability to obtain blood flow velocities focused about a user specified focal region. A continuous transmit waveform of ultrasound energy with a known frequency is transmitted and focused by the System; on the receive side, the transducer receive echoes are continuously amplified, focused about the focal region and converted to a base band quadrature signal. The signal is analyzed by a quadrature phase detector that establishes two receive channels to allow detection of flow direction. These two channels are then analyzed by a fast complex Fourier transform (FFT) circuit to establish the spectrum of frequencies present in the echoes. The data are displayed as spectrum frequencies with respect to time.
	CW can be used alone but is normally used in conjunction with a 2D image for spatial reference. The 2D image has a graphical line (D-line) superimposed on the 2D image indicating where the M-mode beam is located.
Pulsed Wave (PW) Doppler	PW provides a real-time representation of blood flow and is displayed as a velocity-versus-time sweeping output. Velocity (or frequency) is presented as the vertical axis with time along the horizontal axis. The magnitude of the detected signal is represented as different gray scale values. The ultrasound data is derived from a single area, the sample volume, on a stationary beam.
	PW Doppler mode provides the clinician with the ability to obtain blood flow velocities about a spatial sample volume. A burst of ultrasound with a known spectrum is transmitted by the System; on the receive side, the transducer receive echoes are amplified and range gated at the appropriate depth. The signal is analyzed by a quadrature phase detector that establishes two receive channels to allow detection of flow direction. These two channels are then analyzed by a fast complex Fourier transform (FFT) circuit to establish the spectrum of frequencies present in the echoes. The data are displayed as spectrum frequencies with respect to time.
	PW can be used alone but is normally used in conjunction with a 2D image for spatial reference. The 2D image has a graphical line (D-line) superimposed on the 2D image indicating where the M-mode beam is located. The sample volume position (depth) and size are also indicated on the D-Line.

The Doppler functional processing platform is in Figure 3.2.
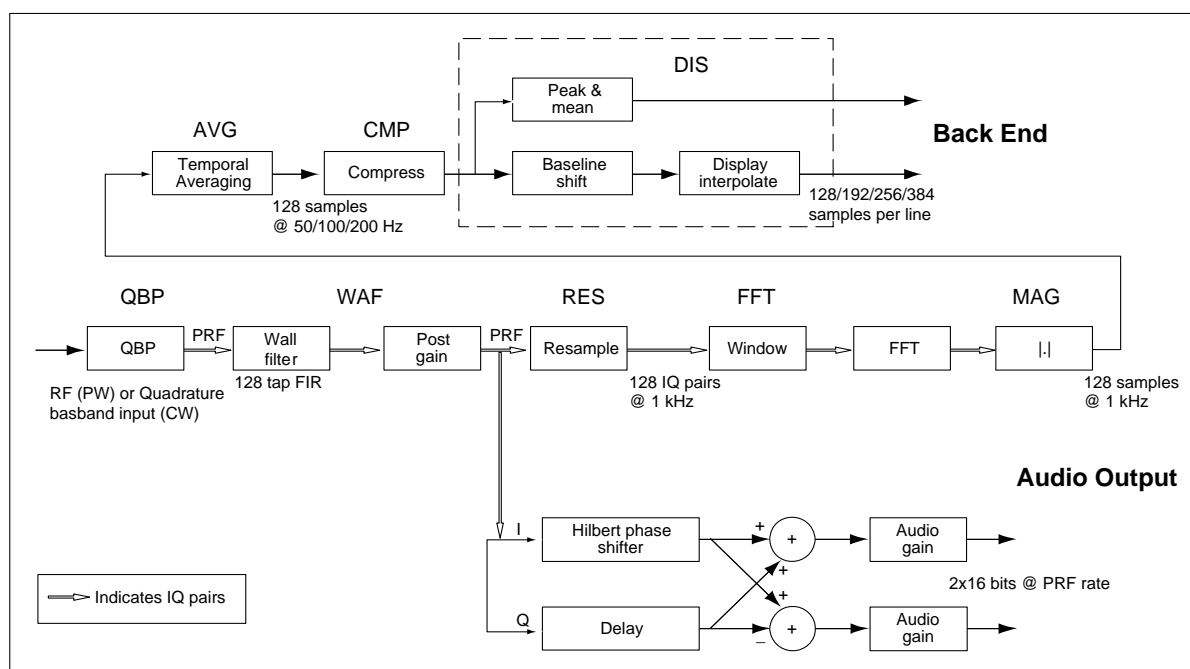
Figure 3.2 Doppler Processing Block Diagram

The Doppler processing platform can be partitioned into eight (8) blocks:

- Wall filter
- Resampler
- Hilbert phase shifter (stereo separator)
- Audio output
- Fast Fourier transformer (FFT)
- Magnitude estimation
- Temporal averaging
- Compression

Wall Filter	The wall filter is a high pass filter used to remove the clutter velocity information or wall motion signal.
Resampler	Time domain Doppler samples are transformed into spectral lines using a fast Fourier transform (FFT) technique. The resampler module does the selection of a sample set used for computing windowed FFTs. It thus interfaces the processing thread operating at the PRF rate with the one that computes FFT on segments of data separated at the FFT rate.
Hilbert Phase Shifter and Audio Output	The gain adjusted IQ stream from the wall filter is processed by a Hilbert Transformer to shift an in-phase component by 90 degrees to present the Doppler signal as stereo audio. The 90 degree phase shift in the in-phase component is accomplished by convolving it with the Hilbert Transform impulse response. The quadrature component data stream does not undergo any filtering other than a delay that matches the group delay of the in-phase channel. This is followed by a stage that computes the sum and difference of in-phase and quadrature components to produce stereo audio data.
Fast Fourier Transformer	This module applies a window function to the IQ sample set selected for spectral estimation followed by the FFT. Radix 2 decimation-in-time FFT is performed using block-floating scaling to retain maximum precision. The resulting output is later normalized during magnitude computation.

Magnitude Estimation	This module combines real and imaginary components to estimate magnitude spectrum. The magnitude of Doppler spectrum is calculated using "cordic approximation", which is done by estimating the complex magnitude by successive approximation. The vectors are reflected into the first quadrant by taking the absolute value, then rotating them sequentially by halved degrees.
Temporal Averaging	Spectral lines are produced by the FFT module at a constant rate. This module averages the appropriate number of spectral lines to produce output lines at the desired display scroll rate.
Compression	The compression module maps the input spectral magnitude values to display output values.

Velocity Color Doppler (VCD)

In Velocity Color Doppler, a real-time, two-dimensional cross-section of blood flow is displayed. The 2D cross-section may be presented as a rectangle, parallelogram, trapezoid, sector, or a full circle, depending on the particular transducer used.

The 2D cross-section is presented as a full color display, with various colors being used to represent the velocity, both positive and negative, of the blood flow echoes. Often, to provide spatial orientation, the full color blood flow cross-section is overlaid on top of the gray scale cross-section of soft tissue structure (2D echo). For each pixel in the overlay, the decision of whether to display VCD, gray scale (echo) information or a blended combination is based on the relative strength of echoes from the soft-tissue structures and from the red blood cells.

A high pass filter (wall filter) is used to remove the signals from stationary or slowly moving structures. Tissue motion is discriminated from blood flow by assuming that blood is moving faster than the surrounding tissue, although additional parameters may also be used to enhance the discrimination. The remaining signal after wall filtering may be averaged over time (persistence) to present a steady state image of blood flow distribution. Variance information may also be displayed to provide information when large variance is observed in the velocity information.

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Additional System Feature Performances

Broadband Imaging	This ultrasound acquisition system uses high resolution uses broadband technology in the transmit pulsers, transducer, and receivers. The receive path can capture and process signals over a wide spectrum, from below 2.0 MHz to beyond 10 MHz. For each application, the transmit pulse is designed to produce an appropriate bandwidth. For example, in 2D grayscale imaging, a wide band pulse is used to support good axial resolution. For Doppler modes, a narrower band pulse is used, which improves the spectral resolution of the detected Doppler signal. In addition to transmit pulse control, programmable digital signal processing is used in the receive path to further refine the bandwidth used to produce the final image. Digital filters are applied to the digitized received signal to limit and shape the spectral bandwidth used to generate the displayed output.
Tissue Specific Imaging	In this feature, parameters for signal and image processing are optimized to maximize the image quality or to obtain the best compromise of resolution and penetration for different specific clinical applications. These parameters include: the order of received filters, the bandwidth, the dynamic range, the compression curve, the gain setting and parameters for compounding frequency band, etc. For example, different system parameter setups are used for abdominal or peritoneal scanning. This feature is for ease of use for the operator by automatically setting up system control parameters rather than manually adjusting settings for best performance.
Biopsy Guidance	The System is capable of displaying a pair of biopsy guidelines that represent the anticipated path of the biopsy needle. The image of an anatomical target, biopsy guidelines, a scan plane marker, and a biopsy needle are displayed on the monitor to assist in guiding the biopsy needle to the target. The system also provides needle guidance for vascular access procedures. Additional information regarding this feature can be found in the biopsy user guides.
Measurement and Calculation Capabilities	The System offers a variety of measurements and calculations, specific to exam type and transducer. A listing of the volume, cardiac, Doppler and obstetrical calculations and measurements that may be made is provided in the User Guide, in the chapter Measurements and Calculations, and author reference in provided the chapter References. Measurement accuracy is discussed the Reference chapter of the User Guide.
Continuous Wave Doppler Audio Output	The system provides for audio output of the CW velocity information. This can be presented as stereo information, with flow moving towards the transducer on one channel and flow away on the other, or as a monaural output with the single audio output representing the summation of the flow directions.
Pulsed Wave Doppler Audio Output	The System provides for audio output of the PW velocity information. This can be presented as stereo information, with flow moving towards the transducer on one channel and flow away on the other, or as a mono output with the single audio output representing the summation of the flow directions.
Electrocardiograph (ECG) Display	ECG is provided to measure the electrical signal generated by the heart. A three lead interface: Right Arm (RA), Left Arm (LA) and Left Leg (LL), is provided on the System. The ECG signal is displayed as an amplitude-versus-time sweeping output. Amplitude is presented on the vertical axis with time along the horizontal axis.

ECG Module

The ECG module allows a representation of the heart electrical activity to be displayed in real time with ultrasound images acquired and displayed on the System video display.

The ECG module interfaces to the patient through three (3) ECG leads: Right Arm ECG lead (RA), Left Arm ECG lead (LA), and Left Leg ECG lead (LL). The ECG received signal from the ECG electrodes are isolated, amplified, and filtered by the ECG module before it is sent to the System for further processing and display.

The ECG module and cable are an integrated assembly. The module receives power from the System. Patient isolation is provided by the ECG module, allowing the connection and signals to the System to be System-ground referenced. The isolation between the patient and the System meets the requirements of IEC 601-1 for Type BF equipment.

The top-level functional block diagram is shown in Figure 3.3.
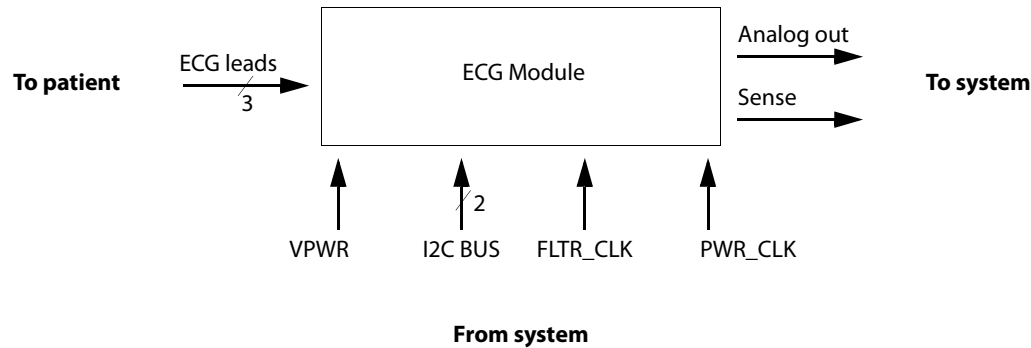
Figure 3.3 ECG Module Block Diagram

The ECG module can be partitioned into six (6) different blocks:

*   Pre-amplifier block
*   Isolation block
*   High pass filter block
*   Variable amplifier block
*   Low pass filter block
*   Power supplies block

Pre-Amplifier	The pre-amplifier block provides the interface to the ECG leads. It provides high levels of common mode rejection and the initial gain for the ECG signal. This block also provides a high pass function to eliminate any large direct current (DC) offsets to allow a moderately high gain to be set before isolation, allowing the front end to set the input equivalent noise of the electrical ECG signal path.
Isolation	The isolation block provides voltage isolation for the analog signal. The voltage isolation between the patient and the system meets the requirement of the ANSI/AAMI EC13 specification.
High Pass Filter	The high pass filter block removes the low frequency components and biases the opt coupler output for the received ECG signal.
Variable Amplifier	The variable amplifier blocks provide additional gain for the received ECG signal. The blocks are used to boost the signal. There are three gain settings for the variable amplifier, controlled by the system through the control bus.

Low Pass Filter	The low pass filter block removes the high frequency component from the received ECG signal. It is used to limit the signal to the frequency range of interest and provide rejection of 50/60 Hz signal content.
Power Supplies	The power supply block receives voltage from the system power supply. It also generates isolation power supplies for the pre-amplifier and isolation blocks. It can be disabled to reduce power consumption while the module is not in use.
Digital Storage and Transfer of Images and Data	The System stores images and data internally for review. Data and images may be recalled from storage for review on the system. Images or data displayed on the screen may be captured on an external video printer or video recorder, or be transferred to a personal computer.

DICOM

The system features Digital Imaging and Communications (DICOM) capability to provide the acceptance, transfer, display, storage, and digital processing of single ultrasound images as well as loops of Ultrasound images.

IMT

The system includes the ability to measure the intima-media thickness (IMT) of the carotid artery using digital ultrasound images.   The intima is that region of the arterial wall from and including the endothelial surface at the lumen to the luminal margin of the media. The media layer extends from the intima to the adventitia of the vessel wall. The adventitia is normally quite echogenic on ultrasound images when compared to the media. The IMT measurement of the carotid artery may be used adjunctively with other medical data obtained by a physician to help assess the cardiovascular health of a patient.

System Specifications

This section contains system and accessory specifications and agency approvals. The specifications for recommended peripherals can be found in the manufacturers' instructions.

System Dimensions

Length: 11.8 in. (29.97 cm)
Width: 10.8 in. (27.43 cm)
Height: 3.1 in. (7.87 cm)
Weight: 8.5 lbs. (3.9 kg) with the C60e transducer and battery installed

Display Dimensions

Length: 8.4 in. (21.34 cm)
Height: 6.3 in. (16 cm)
Diagonal: 10.4 in. (26.4 cm)

Transducers

C60e/5-2 MHz 60 mm curved array (5 ft./1.5 m)
HFL38/13-6 MHz 25 mm linear array (5.5 ft./1.7 m)
ICT/8-5 MHz 11 mm intracavitary array (5 ft./1.5 m)
L38e/10-5 MHz 38 mm linear array (5.5 ft./1.7 m)
P17/5-1 MHz 17 mm phased array (6 ft./1.8 m)
TEE/8-3 MHz phased array (11.15 ft./3.4 m)

Imaging Modes

2D (256 gray shades)
Color power Doppler (CPD) (256 colors)
Color Doppler (Color) (256 colors)
M Mode
Pulsed wave (PW) Doppler
Continuous Wave (CW) Doppler
Tissue Harmonic Imaging

Image Storage

The number of images saved to the CompactFlash card vary depending on the card storage capacity.
Cine buffer

Accessories

Hardware, Software, and Documentation

AIUM Ultrasound Medical Safety Guidance Document
Battery
Biopsy Guide
Carry case
External display
Guidance on the interpretation of TI and MI to be used to inform the operator, Annex HH, BS EN 60601-2-37
Mobile Docking System Lite (MDS Lite)
Mobile Docking System (MDS)
Mini-Dock
Power supply
Quick Reference Guide
SiteLink Image Manager 3.0
SonoCalc IMT
System User Guide
Triple Transducer Connect
Ultrasound gel

Cables

See the *MicroMaxx Ultrasound System User Guide*, *MDS User Guide*, and the *MDS Lite User Guide* for information on cables.

Peripherals

See the manufacturer's specifications for the following peripherals.

Medical Grade

Black-and-white printer

Recommended sources for printer paper: Contact Sony at **1-800-686-7669** or **www.sony.com/professional** to order supplies or to obtain the name and number of the local distributor.

Color printer

Video cassette recorder

Non-Medical Grade

Kensington Security Cable

Temperature, Pressure, and Humidity Limits

Note: The temperature, pressure, and humidity limits apply only to the ultrasound system and transducers.

Operating Limits: System

- 10–40°C (50–104°F), 15–95% R.H.
- 700 to 1060hPa (0.7 to 1.05 ATM)

Shipping/Storage Limits: System without Battery

- -35–65°C (-31–149°F), 15–95% R.H.
- 500 to 1060hPa (0.5 to 1.05 ATM)

Operating Limits: Battery

- 10–40°C (50–104°F), 15–95% R.H.

Shipping/Storage Limits: Battery

- -20–60°C (-4–140°F), 0–95% R.H.*
- 500 to 1060hPa (0.5 to 1.05 ATM)

* For storage longer than 30 days, store at or below room temperature.

Operating Limits: Transducer

- 10–40°C (50–104°F), 15–95% R.H.

Shipping/Storage Limits: Transducer

- -35–65°C (-31–149°F), 15–95% R.H.

Electrical

Power Supply Input: 100-240 VAC, 50/60 Hz, 1.2 A Max @ 100 VAC.

Power Supply Output (system on):	(1) 15 VDC, 2.7A Max (system)
	(2) 12.6 VDC, 0.8A Max (battery charging)
Power Supply Output (system off):	(1) 15 VDC, 2.0A Max (system)
	(2) 12.6 VDC, 1.8A Max (battery charging)
	Combined output not exceeding 52W.

Battery

6-cell, 11.25 VDC, 4.4 amp-hours, rechargeable lithium ion battery pack.

Run time is 2 hours or more, depending on imaging mode and display brightness.

Electromechanical Safety Standards

EN 60601-1:1997, European Norm, Medical Electrical Equipment–Part 1. General Requirements for Safety.

EN 60601-1-1:2001, European Norm, Medical Electrical Equipment–Part 1. General Requirements for Safety–Section 1-1. Collateral Standard. Safety Requirements for Medical Electrical Systems.

EN 60601-2-37:2001, European Norm, Particular requirements for the safety of ultrasonic medical diagnostic and monitoring equipment.

CAN/CSA C22.2, No. 601.1-M90:1990, Canadian Standards Association, Medical Electrical Equipment–Part 1. General Requirements for Safety.

CEI/IEC 61157:1992, International Electrotechnical Commission, Requirements for the Declaration of the Acoustic Output of Medical Diagnostic Ultrasonic Equipment.

UL 60601-1:2003, Underwriters Laboratories, Medical Electrical Equipment-Part 1: General Requirements for Safety.

EMC Standards Classification

EN 60601-1-2:2001, European Norm, Medical Electrical Equipment. General Requirements for Safety-Collateral Standard. Electromagnetic Compatibility. Requirements and Tests.

CISPR11:2004, International Electrotechnical Commission, International Special Committee on Radio Interference. Industrial, Scientific, and Medical (ISM) Radio-Frequency Equipment Electromagnetic Disturbance Characteristics-Limits and Methods of Measurement.

The Classification for the SonoSite system, SiteStand, accessories, and peripherals when configured together is: Group 1, Class A.

Airborne Equipment Standards

RTCA/DO160D:1997, Radio Technical Commission for Aeronautics, Environmental Conditions and Test Procedures for Airborne Equipment, Section 21.0 Emission of Radio Frequency Energy, Category B.

DICOM Standard

NEMA PS 3.15: 2000, Digital Imaging and Communications in Medicine (DICOM)-Part 15: Security Profiles.

HIPAA Standard

The Health Insurance and Portability and Accountability Act, Pub.L. No. 104-191 (1996).

45 CFR 160, General Administrative Requirements.

45 CFR 164, Security and Privacy.

SonoSite

Chapter 4: Setup and Operation

System Controls
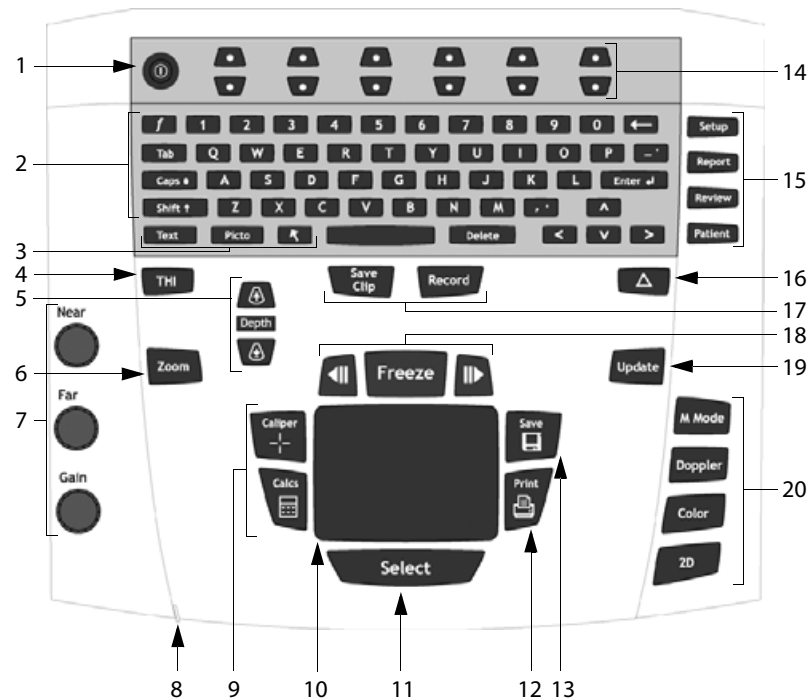
Figure 4.1 System Controls

Table 4.1: System Controls

Number	System Control	Description
1	Power	Turns system on and off.
2	Alphanumeric	Use to enter text and numbers.
3	**Annotation**	
	Text	Turns the keyboard on and off for text entry.
	Picto	Turns the pictographs/pictograph marker on and off.
	Arrow	Displays an arrow that can be moved and rotated within the image area.
4	THI	Turns Tissue Harmonic Imaging on and off.
5	Depth	Adjusts the imaging depth for 2D.
	Depth Up	Decreases imaging depth.
	Depth Down	Increases imaging depth.
6	Zoom	Magnifies image 2x.

Table 4.1: System Controls (Continued)

Number	System Control	Description
7	Near	Adjusts the gain applied to the near field of the image.
	Far	Adjusts the gain applied to the far field of the image.
	Gain	Adjusts the overall gain applied to the entire image.
8	AC power indicator	A steady green light indicates AC power is connected. A flashing green light indicates the system is in sleep mode.
9	Caliper/Calcs	Caliper activates a measurement caliper on the screen. Calcs turns the calculation menu on and off.
10	Touchpad	Use to select, adjust, and move objects on the screen.
11	Select	Use to switch between frozen images in duplex and dual screens. color and Doppler menus, calipers for measurement (calipers), pictograph marker position/angle (picto), arrow position/orientation (arrow).
12	Print	Prints the active image to the printer.
13	Save	Saves an image to the CompactFlash card. Saves an image to the CompactFlash card and saves measurements/calculation to the report when configured in system setup.
14	Remappable controls	Controls features on the context menu which are adjusted based on the system state.
15	**Forms**	
	Setup	Access to the system settings.
	Report	Access to the patient report.
	Review	Access to the patient list and saved patient images, and archive functions.
	Patient	Access to patient information.
16	△ (Delta key)	Use as a shortcut to existing functionality in the system.
17	Save clip	Saves a clip to the CompactFlash card.
	Record	Turns DVD/VCR record on and off.
18	Freeze	Stops the live imaging and displays a frozen image.
	Cine (back/forward)	Review images stored in the cine buffer; back/forward through last-in, first-out sequence. All mode images can be stored and reviewed in the cine buffer.
19	Update	Toggles between dual and duplex screens and image modes in M Mode and Doppler, e.g., between 2D Doppler sample line and Doppler spectral trace.

SonoSite

Number	System Control	Description
20	**Modes**	
	M Mode	Turns M Mode on and toggles between M Mode sample line and the M Mode trace.
	Doppler	Turns Doppler on and toggles between Doppler sample line and the Doppler trace.
	Color	Turns CPD/Color on and off.
	2D	Turns 2D on.

System Components

The SonoSite system components are identified in "About the System" on page 2.

Setup

System setup is used to customize the system. Press the **Setup** key to access and set up the following system functions:

Administration	Configure system to protect patient data by requiring users to log on and enter passwords.
Audio, Battery	Configure for type of Audio alert, Sleep delay, and Power delay.
Connectivity	Configure Printer, Video mode, Serial Port, and Transfer Mode: DICOM or SiteLink. (DICOM and SiteLink are optional features.)
Date and Time	Configure Date and Time functions.
Delta Key, F Keys	Configure existing system functionality as a shortcut and create predefined labels for images.
Display Information	Configure information displayed on image: patient information, mode data, and system status data.
IMT calculations	Configure the IMT calculation menu and presets.
OB Calculations	Select OB calculation authors.
OB Custom Measurements	Configure system for user defined measurements. (OB Custom Measurements are an optional feature.)
Presets	Configure Preset functions: Doppler Scale, Duplex, Live Trace, Thermal Index, Save Key, and Dynamic Range.
System Information	Displays system hardware and software versions.

Setup Security Settings

Security Setup

WARNING:	Health care providers who maintain or transmit health information are required by the Health Insurance Portability and Accountability Act (HIPAA) of 1996 and the European Union Data Protection Directive (95/46/EC) to implement appropriate procedures: to ensure the integrity and confidentiality of information; to protect against any reasonably anticipated threats or hazards to the security or integrity of the information or unauthorized uses or disclosures of the information.

SonoSite provides a comprehensive set of tools on the system that allows its customers to meet the applicable security requirements listed in the HIPAA standard. SonoSite's customers are ultimately responsible for ensuring the security and protection of all electronic protected health information collected, stored, reviewed, and transmitted on the system.
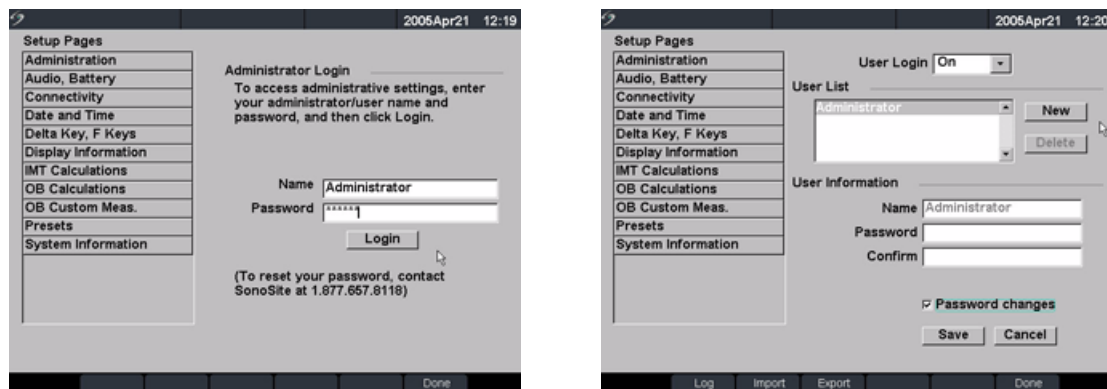

Figure 5 Setup Screens: Administration and Administrator Information

Administrator Login	1	Press the **Setup** key.
	2	Select Administration.
	3	In Administrator Login, type Administrator in the Name field.
	4	Call SonoSite for the password (1-877-657-8118).
	5	Select Login.
Change Administrator Password	1	In User Information, enter your new password in the Password field.
	2	Enter the password again in the Confirm field.
		To ensure passwords are secure, it is recommended that passwords contain characters from the following categories:
		• Upper case characters: A-Z
		• Lower case characters: a-z
		• Numbers: 0-9
		Note: The password is case-sensitive.
	3	In Password changes, click on the check box to allow users access to change their password or leave unchecked to restrict access. (Optional)
	4	Select Save.

|		
User Login Setting	1	In the User Login list, select On or Off.
		• Selecting On restricts access to the system and requires the user to enter a user name and password.
		• Selecting Off allows access to the system and does not require the user to enter a user name and password.
	2	After making changes in the Administration setup, reboot the system to log off as administrator.

User Setup
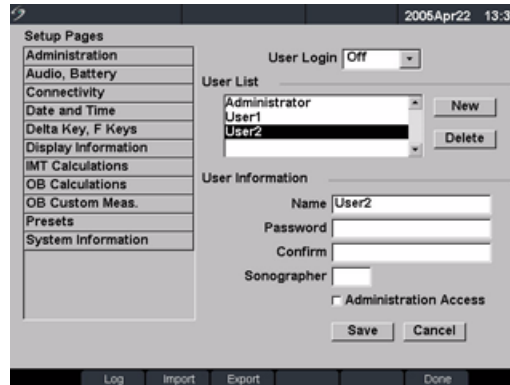
Figure 6 Setup Screen: User List Information

Add New User	1	Select New.
	2	In User Information, enter information in Name, Password, and Confirm fields.
		To ensure passwords are secure, it is recommended that passwords contain characters from the following categories:
		• Upper case characters: A-Z
		• Lower case characters: a-z
		• Numbers: 0-9
		Note: The name and password are case-sensitive.
	3	In Sonographer, enter the user's initials to display the information in the patient header and the sonographer field in the Patient Information form. (Optional)
	4	In Administration Access, click the check box to allow users access to all administration privileges or leave unchecked to restrict access. (Optional)
	5	Select Save.
Modify User Information	1	In the User List, select desired user name.
	2	Enter the new name.
	3	Enter the new password and confirm.
	4	Select Save.
		Any change to the user name replaces the old name.
Delete User	1	In the User List, select the desired user name.
	2	Select Delete.
		A dialog is displayed.
	3	Select Yes to delete or No to cancel.
Change User Password	1	In the User List, select the desired user name.
	2	Enter the new password and confirm.
	3	Select Save.
Done		Select Done from the on-screen menu to return to live imaging.

Export or Import User Accounts

Note: Export and import are used to configure multiple systems and to back up user account information.

Export User Account	1	Insert the CompactFlash card in the back slot of the system. See "Installing and Removing the CompactFlash Card" on page 39.
	2	Press the **Setup** key.
	3	Select Administration.
	4	Select Export from the on-screen menu.
		All user names and passwords are copied to the CompactFlash card.
	5	Remove the CompactFlash card.
Import User Account	1	Insert the CompactFlash card in the back slot of the system. See "Installing and Removing the CompactFlash Card" on page 39.
	2	Press the **Setup** key.
	3	Select Administration.
	4	Select Import from the on-screen menu.
		A dialog box is displayed.
	5	After all user names and passwords are imported, the system restarts.
		Note: All user names and passwords currently on the system are replaced with the imported data.
Reset		Select Reset from the on-screen menu to return settings for this setup page to factory default.

Export and Clear Event Log

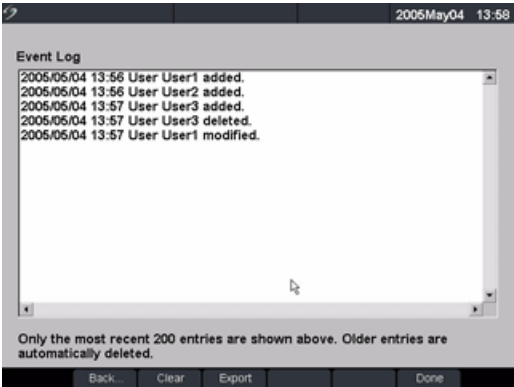The Event Log collects errors and events and can be exported to a CompactFlash card and read by a CompactFlash reader.

Figure 7 Event Log

Event Log	1	Press the **Setup** key.
	2	Select Administration.
	3	Select Log from the on-screen menu.
		The Event Log is displayed.
	4	Select Back to return to the previous menu.

|	
Export Event Log	*Note: The Event log and the DICOM network log have the same filename (log.txt). When you export either one to the same CompactFlash card, it will overwrite the existing log.txt file.*
	1 Insert the CompactFlash card in the back slot of the system.
	2 Select Log and then Export from the on-screen menu.
	3 View the files on a CompactFlash reader.
	The log is a text file that can be opened by a text file application, e.g., Microsoft Word or Notepad. The log file is named log.txt.
Clear Event Log	1 Select Clear from the on-screen menu.
	2 Select Yes to delete or No to cancel.

Login to System as User
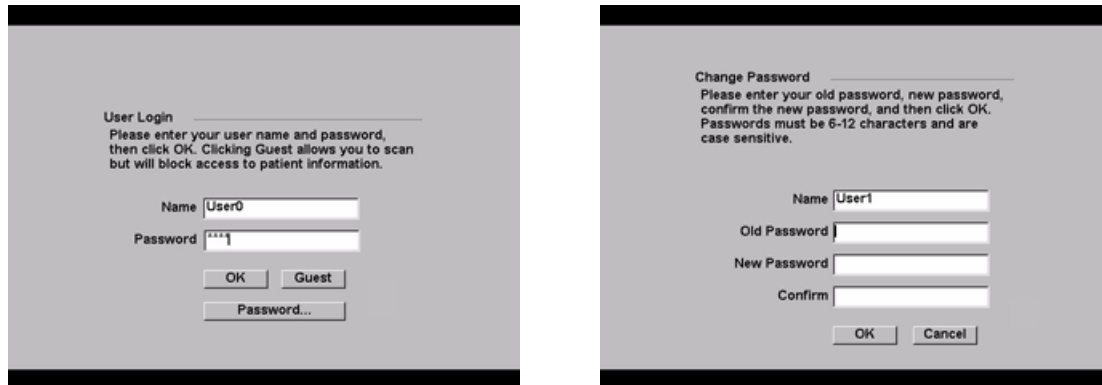
Figure 8 User Login and Change Password

Note: User Login is displayed when system access is turned on.

User Login	In User Login, enter Name and Password and click OK.
Guest Login	In User Login, select Guest.
	In Guest mode the user is able to scan but is restricted from accessing system setup and patient information.
Change Password	1 In User Login, select Password.
	2 Enter your old password, new password, confirm the new password and then click OK.
	To ensure passwords are secure, it is recommended that passwords contain characters from the following categories:
	• Upper case characters: A-Z
	• Lower case characters: a-z
	• Numbers: 0-9
	Note: The password is case-sensitive.

Audio and Battery
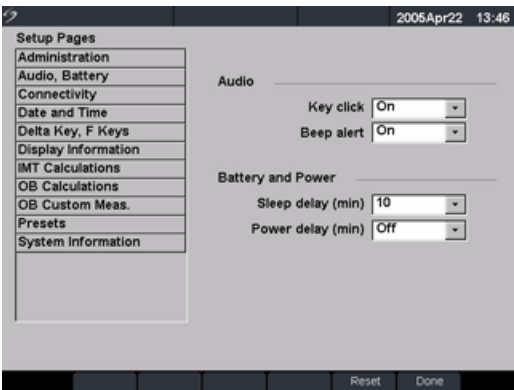
Figure 9 Setup Screen: Audio, Battery

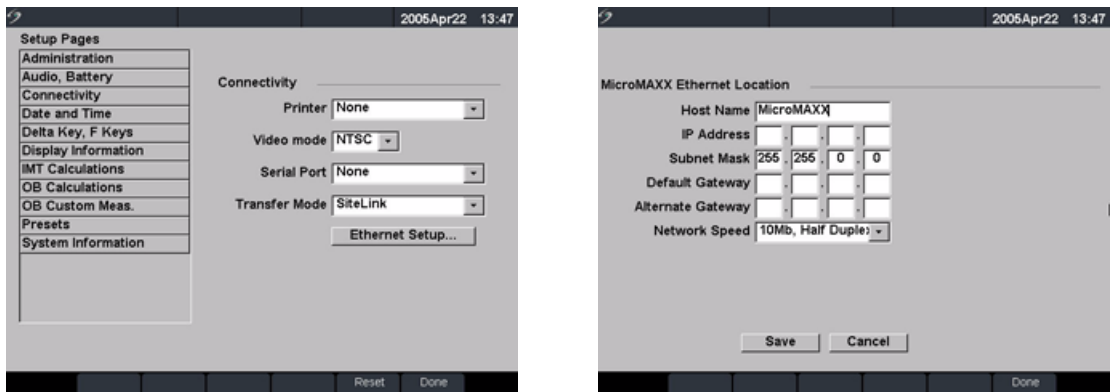|		
Key Click	1	Press the **Setup** key.
	2	Select Audio, Battery.
	3	In the Key click list, select On or Off.
Beep Alert	1	Press the **Setup** key.
	2	Select Audio, Battery.
	3	In the Beep alert list, select On or Off.
Sleep Delay	1	Press the **Setup** key.
	2	Select Audio, Battery.
	3	In the Sleep delay list, select Off, 5, or 10 minutes.
Power Delay	1	Press the **Setup** key.
	2	Select Audio, Battery.
	3	In the Power delay list, select Off, 15, or 30 minutes.
Reset		Select Reset from the on-screen menu to return settings for this setup page to factory default.

Connectivity

Figure 10 Setup Screens: Connectivity and Ethernet

Printer	1	Press the **Setup** key.
	2	Select Connectivity.
	3	In the Printer list, select the desired printer from the list of recommended printers.
Video Mode	1	Press the **Setup** key.
	2	Select Connectivity.
	3	In the Video mode list, select NTSC or PAL for the desired mini-dock video output.
Serial Port	1	Press the **Setup** key.
	2	Select Connectivity.
	3	In the Serial Port list, select VCR, DVD, or Computer (PC).
	4	Restart the system to activate VCR or DVD connectivity.
	5	Attach a serial cable (RS-232) to the serial port from the mini-dock/MDS to the VCR, DVD, or PC.
		Note: If PC is selected, the system allows report data to be sent as ASCII text from the system to a PC. Special third party software must be on the PC to acquire, view, or format the data into a report. Check the compatibility of your software with SonoSite technical support.
Transfer Mode	1	Press the **Setup** key.
	2	Select Connectivity.
	3	In the Transfer Mode list, select DICOM or SiteLink.
		After changing connectivity, a dialog box is displayed to restart the system.
		Note: The settings for SiteLink Image Manager and system configurations must correspond. See the SiteLink Image Manger 3.0 User Guide.
Ethernet Connectivity	1	Press the **Setup** key.
	2	Select Connectivity.
	3	In the Transfer Mode list, select SiteLink.
		After changing connectivity, a dialog box is displayed to restart the system.

| Ethernet Setup | 1 Press the **Setup** key. |
	2 Select Connectivity.
	3 Select Ethernet Setup.
	4 Enter information in the following fields: (see DICOM chapter for definition of terms)
	• Host Name
	• IP Address
	• Subnet Mask
	• Default Gateway
	• Alternate Gateway
	5 In the Network Speed list, select from the list.
	6 Select Save.
Reset	Select Reset from the on-screen menu to return settings for this setup page to factory default.

Date and Time
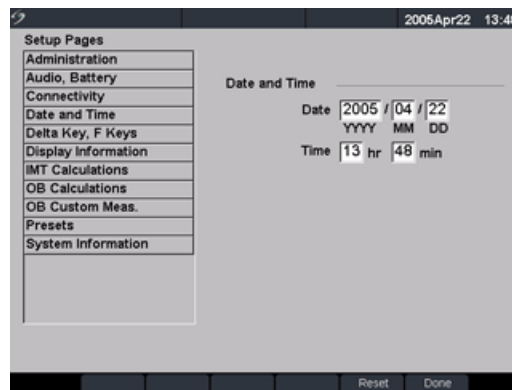
Figure 11 Setup Screen: Date and Time

| WARNING: | An accurate date and time are critical for accurate obstetrics calculations. Verify that the date and time are accurate before each use of the system. The system does not automatically adjust for daylight savings time changes. |

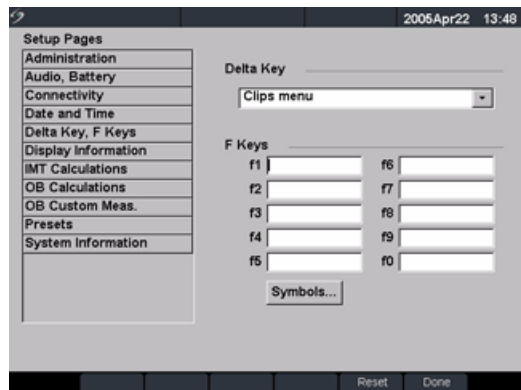| **Date** | 1 Press the **Setup** key. |
	2 Select Date and Time.
	3 In the Date field, enter the current date (year, month, and day).
Time	1 Press the **Setup** key.
	2 Select Date and Time.
	3 In the Time field, enter the current time in 24 hour format (hours and minutes).
Reset	Select Reset from the on-screen menu to return settings for this setup page to factory default.

Delta Key and F Keys

Figure 12 Setup Screen: Delta Key, F Keys

|		
Delta Key	1	Press the **Setup** key.
	2	Select Delta Key, F Keys.
	3	Select desired functionality for the Delta key.
		The Delta key will now control this function.
F Keys	1	Press the **Setup** key.
	2	Select Delta Key, F Keys.
	3	Type desired text. Use the **Backspace** key or **Delete** key to correct mistakes.
Reset		Select Reset from the on-screen menu to return settings for this setup page to factory default.

Display Information
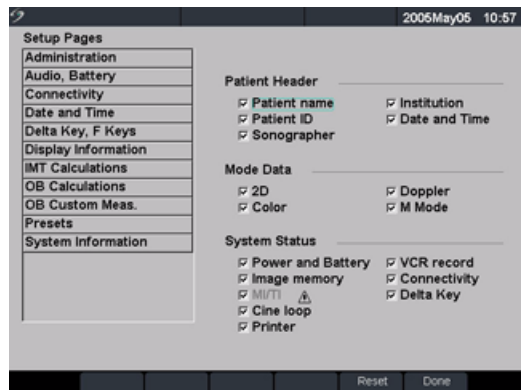
Figure 13 Setup Screen: Display Information

Patient Header	1	Press the **Setup** key.
	2	Select Display Information.
	3	Select the desired check boxes to display desired information in the patient header.
Mode Data	1	Press the **Setup** key.
	2	Select Display Information.
	3	Select the desired check boxes to display imaging information on the screen.

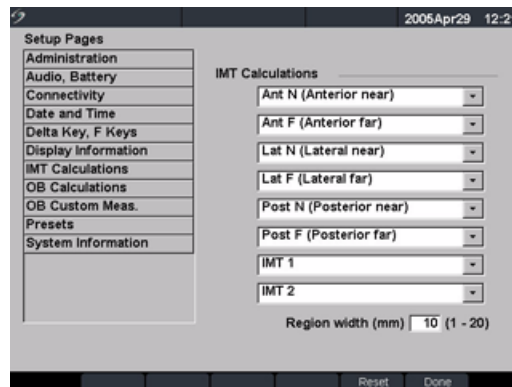|		
System Status	1	Press the **Setup** key.
	2	Select Display Information.
	3	Select the desired check boxes to display the system status on the screen.
Reset		Select Reset from the on-screen menu to return settings for this setup page to factory default.

IMT Calculations

Figure 14 Setup Screen: IMT Calculations

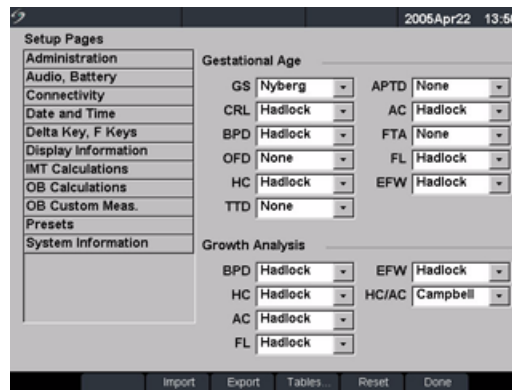|		
IMT Calculations	1	Press the **Setup** key.
	2	Select IMT Calculations.
	3	In the IMT calculations list, select the desired labels.
		• Selecting a label places the measurement on the Calculation menu and within the report.
		• Selecting None removes a label.
Reset		Select Reset from the on-screen menu to return settings for this setup page to factory default.

OB Calculations Authors

Figure 15 Setup Screen: OB Calculations

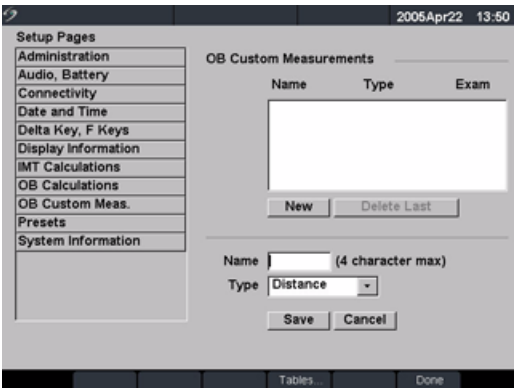|		
Gestational Age Growth Analysis	1	Press the **Setup** key.
	2	Select OB Calculations.
	3	In Gestational Age or Growth Analysis lists, select the desired OB authors.
		Selecting an author places the measurement on the calculation menu and selecting None removes the measurement from the calculation menu.
More...		More... displays the list of user defined custom measurements and allows you to associate a custom table for the custom measurement. This is only available when a user defined custom table has been created for the custom measurement.
Export	1	Insert a blank CompactFlash card in the back slot of the system.
	2	Press the **Setup** key.
	3	Select OB Calculations.
	4	Select Export from the on-screen menu.
		All user defined tables and measurements are copied to the CompactFlash card.
Import	1	Insert the CompactFlash card in the back slot of the system.
	2	Press the **Setup** key.
	3	Select OB Calculations.
	4	Select Import from the on-screen menu.
	5	After all user defined tables and measurements are imported, the system restarts.
		Note: All user defined tables and measurements currently on the system are replaced with imported data.
	6	Select Done from the on-screen menu to return to live imaging.
Tables...		Tables... displays system OB tables or is used to create custom OB tables. See "OB Custom Tables" on page 35.
Reset		Select Reset from the on-screen menu to return settings for this setup page to factory default.

OB Custom Measurements

Figure 16 Setup Screen: OB Custom Measurements

|		
OB Custom Measurements	1	Press the **Setup** key.
	2	Select OB Custom Meas.
	3	Select New.
	4	In the Name field, enter a unique name.
	5	In the Type list, select the desired measurement type.
	6	Select Save.
		The new measurement is displayed in the calculations menu and the OB report. Up to five custom measurements may be saved.
Delete OB Custom Measurement	1	Press the **Setup** key.
	2	Select OB Custom Meas.
	3	In the Custom Measurements list, highlight the last measurement.
	4	Select Delete Last.
	Note: If associated tables and report data exist for the measurement, they will be removed from the system.	
Tables...	Select Tables... from the on-screen menu to create Gestational Age tables for a custom OB measurement. See "OB Custom Tables".	

OB Custom Tables
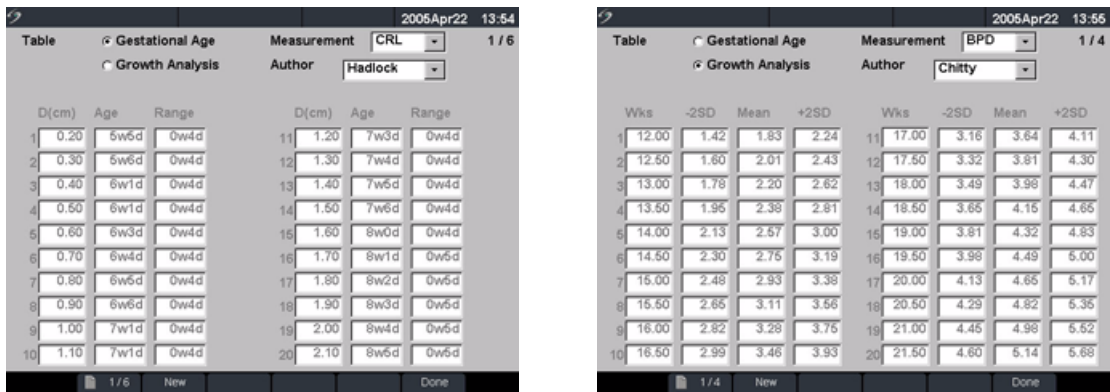
Figure 17 Setup Screen: OB Custom Table

Age Table Measurements: The system provides gestational age measurements by selected authors for the age table measurements listed in Table 4.2.

Growth Analysis Table Measurements: The system provides growth graphs or curves for the growth table measurements listed in Table 4.2.

Table 4.2: OB Custom Table Measurements

Age Table Measurements	GS, CRL, BPD, OFD, HC, TTD, AC, FTA, FL, 5 additional custom measurement labels
Growth Analysis Table Measurements	BPD, HC, AC, FL, EFW

WARNING: Prior to use, verify custom table data entries are correct. The system does not confirm the accuracy of the custom table data entered by the user.

View OB Tables	1	Press the **Setup** key.
	2	Select OB Custom Meas. or OB Calculations.
	3	Select Tables... from the on-screen menu.
	4	Select the desired table (Age or Growth) and measurement/author.
Create New OB Custom Tables	1	Press the **Setup** key.
	2	Select OB Custom Meas. or OB Calculations.
	3	Select Tables... from the on-screen menu.
	4	Select the desired table (Age or Growth).
	5	In the measurement list, select the desired measurement for the custom table.
	6	Select New from the on-screen menu.
	7	In the Author field, enter a unique name.
	8	Enter the data.
	9	Select Save from the on-screen menu.

Two custom tables may be created for each OB measurement.

Note: To display the measurement for the custom table in the calculation menu, see "OB Calculations Authors" on page 33 and select More...

Note: Growth analysis tables cannot be created for custom OB measurements.

|		
Edit OB Custom Tables	1	Press the **Setup** key.
	2	Select OB Custom Meas. or OB Calculations.
	3	Select Tables... from the on-screen menu.
	4	Select the desired custom OB table.
	5	Select Edit and enter data and then select Save from the on-screen menu.
Delete OB Custom Tables	1	Press the **Setup** key.
	2	Select OB Custom Meas. or OB Calculations.
	3	Select Tables... from the on-screen menu.
	4	Select the desired custom OB table.
	5	Select Delete from the on-screen menu to remove the custom table from the system.

Presets
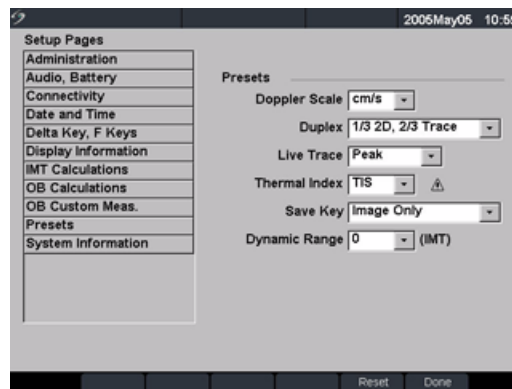
Figure 18 Setup Screen: Presets

Doppler Scale	1	Press the **Setup** key.
	2	Select Presets.
	3	In the Doppler Scale list, select cm/s or kHz.
Duplex	1	Press the **Setup** key.
	2	Select Presets.
	3	In the Duplex list, select desired image display.
		• Full 2D, Full Trace
		• 1/3 2D, 2/3 Trace
		• 1/2 2D, 1/2 Trace
Live Trace	1	Press the **Setup** key.
	2	Select Presets.
	3	In the Live Trace list, select Peak or Mean.
Thermal Index	1	Press the **Setup** key.
	2	Select Presets.
	3	In the Thermal Index list, select TIS, TIB, or TIC.

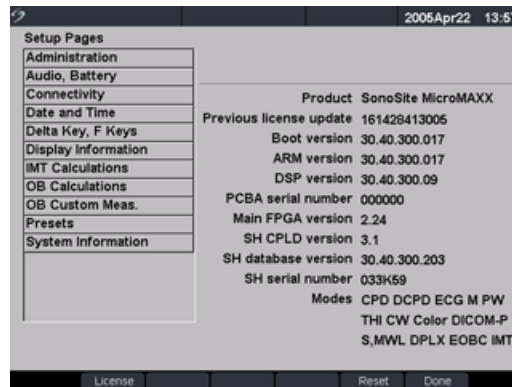|		
Save Key	1	Press the **Setup** key.
	2	Select Presets.
	3	In the Save key list, select Image Only or Image/Calcs to designate the function of the Save key.
		• Selecting Image Only allows the **Save** key to save the image to the CompactFlash card.
		• Selecting Image/Calcs allows the **Save** Key to save the image to the CompactFlash card and to save the current calculation to the report.
Dynamic Range	1	Select the desired exam type.
	2	Press the **Setup** key.
	3	Select Presets.
	4	Select the desired dynamic range setting (-3, -2, -1, 0, +1, +2, +3).
		Note: Negative numbers show higher contrast images and positive numbers show lower contrast images.
Reset		Select Reset from the on-screen menu to return settings for this setup page to factory default.

System Information

Figure 19 Setup Screen: System Information

System Information	1	Press the **Setup** key.
	2	Select System Information from the on-screen menu.
		Note: To install a license key see "Install License Key" on page 47.
Change to Default Settings	1	Turn the system off.
	2	Connect the system to AC power. See "Operate System Using AC power" on page 40.
	3	Simultaneously press and release **1** and the **Power** key.
		The system beeps several times and then the image display appears with all default settings.
		Note: Default settings cannot be changed by the user. Default settings are set at the factory.

Touchpad

The touchpad is used to select, adjust, and move objects on the screen. For example, it controls the caliper position, CPD/Color box position, floating cursor, and more.

Note: The arrow keys control much of the same functionality as the touchpad.

Accessories

For information about accessories and other SonoSite products, refer to the user guide for each product.

Preparing the System for Operation

Installing and Removing the Battery

Caution:	Use only the specified SonoSite battery pack. For battery safety notes, see "Battery Safety" on page 7.

The battery comprises six lithium-ion cells plus electronics, a temperature sensor, and battery contacts. If the battery is being installed for the first time, it will need to be charged.

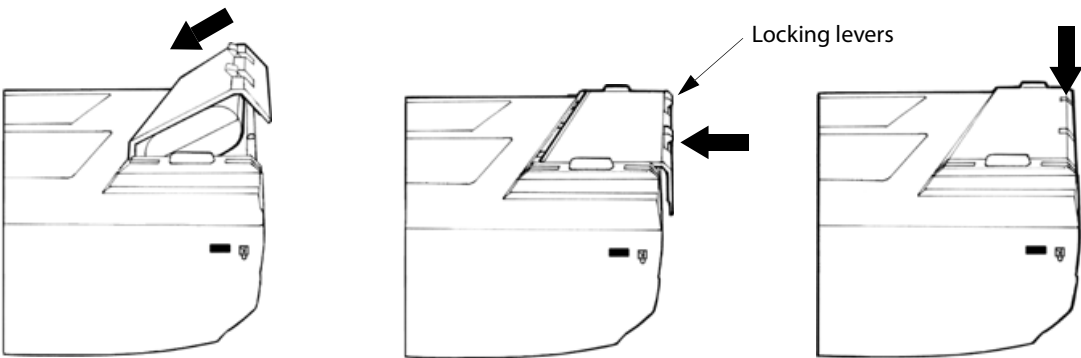| WARNING:	To avoid injury to the operator and to prevent damage to the ultrasound system, inspect the battery for leaks prior to installing.

Locking levers

Figure 4.1 Insert Battery into System

Install Battery	1	Disconnect the power supply from the ultrasound system.
	2	Turn the system upside down.
	3	Place the battery into the battery compartment, at a slight angle. See Figure 4.1.
	4	Slide the battery forward until it locks into place.
	5	Push down on the two locking levers to secure battery.
Remove Battery	1	Push up on the two locking levers.
	2	Slide the battery back.
	3	Lift the battery from the compartment.

SonoSite

Installing and Removing the CompactFlash Card

Images and clips are saved to a CompactFlash card and are organized in a patient list. The images and clips in the patient list are organized alphabetically by the patient name and ID. Images and clips are archived from the ultrasound system to a PC using a USB, Ethernet connection, or CompactFlash card. Images and clips on the CompactFlash card cannot be viewed directly from a CompactFlash reader.

Install CompactFlash Card

1. Verify the ejector pin is fully pushed in.
2. Insert the CompactFlash card into the front slot on the ultrasound system. See Figure 1.1 on page 2.
   - The front slot is used to store images.
   - The back slot is used to update systems/transducers and to import/export DICOM configuration information and OB Tables.
   - The CompactFlash card is ready to use when the save icon and the image and clip counters are displayed on the screen.

Caution: If the CompactFlash icon and image and clip counters are not displayed in the system status, the CompactFlash card may be defective. Turn the system off and replace the CompactFlash card. The CompactFlash card may be restored if it is formatted on a PC. Formatting the card will erase all data. If the card is physically damaged, formatting will not restore it.

WARNING: To prevent loss of data, (e.g. images/clips), or damage to the CompactFlash card, always turn the ultrasound system off before removing the CompactFlash card.

Remove CompactFlash Card

1. Turn off the ultrasound system before removing the card.
2. Press the ejector pin in the front card slot to position it to the outside of the system. See Figure 1.1 on page 2.
3. Press in the ejector pin to eject the CompactFlash card.
4. Remove the card.
5. Push in the ejector pin to avoid damaging the ejector pin.

Using AC Power/Charging Battery

The battery charges when the system is connected to the AC power supply. If the system is off or in the sleep state (display off), a completely discharged battery will fully charge in 2.5 to 3.5 hours. If the system is on and in the freeze state, a completely discharged battery will fully charge in 5 to 6 hours. If the system is in the imaging state, the battery is trickle charged at a very low rate and would take several days to fully charge.

Note: To minimize recharging time, turn the system off.

The system can run on AC power and charge the battery in three ways.

- Connected directly to the system
- Connected to the mini-dock (See the *Mini-Dock User Guide*.)
- Connected to the MDS (See the *MDS User Guide* or *MDS Lite User Guide*.)

WARNING:	The equipment shall be connected to a center-tapped single phase supply circuit when users in the United States connect the equipment to a 240V supply system.

Caution:	Verify the hospital supply voltage corresponds to the power supply voltage range. See "Electrical" on page 19.

Operate System Using AC power	1	Connect the DC power cable from the power supply to the connector on the system. See Figure 1.2 on page 2.
	2	Connect the AC power cord to the power supply and connect to a hospital-grade electrical outlet.

Battery Charge Indicators

The Battery Charge Indicator, a battery icon located on the upper right hand section of the display, indicates the current battery level.

- All Battery Indicator segments lit mean the system battery is fully charged.
- Some Battery Indicator segments lit mean the system battery is partially charged.
- When the battery is charging the Battery Indicator segments light sequentially.

Table 4.3 contains the charging specifications for the system.

Table 4.3: System Charging Specification

System Charging Parameter	Specification
Charge time to 80% capacity, with System power off	3 hours @ 25° C
Charge time to 80% capacity, with System power on	6 hours @ 25° C

Connecting and Removing the Transducer

WARNING:	To avoid injury to the patient, do not place the connector on the patient. Operate the ultrasound system in the MDS or on a flat, hard surface to allow air flow past the connector.

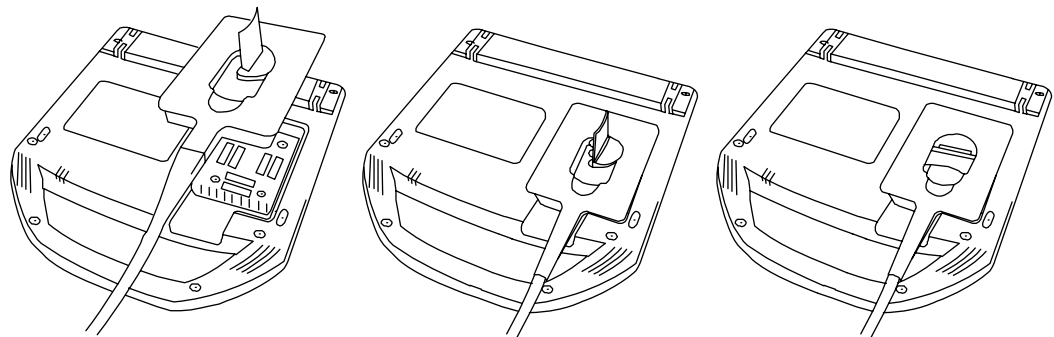| Caution:	To avoid damaging the transducer connector, do not allow foreign material in the connector.

Figure 4.2 Connect the Transducer

Connect Transducer to System	1	Turn the system upside down (if not in MDS).
	2	Pull the transducer latch up and rotate it clockwise.
	3	Align the transducer connector with the connector on the bottom of the system.
	4	Insert the transducer connector into the system connector.
	5	Turn the latch counterclockwise.
	6	Press the latch down, securing the transducer connector to the system.
Remove Transducer	1	Pull the latch up and rotate it clockwise.
	2	Pull the transducer connector away from the system.

Turning System On/Off

Caution:	Do not use the system if an error message appears on the display. Note the error code and turn off the system. Call SonoSite or your local representative.

Turn System On/Off	1	Locate the **Power** key on the top left side of the system. See Figure 4.1 on page 21.
	2	Press the **Power** key once to turn on and once to turn off.
Wake Up System		To conserve battery life, the system is configured to go into sleep mode. The system goes into sleep mode when the lid is closed or if the system has not been touched for a preset amount of time. Press any key, touch the touchpad, or open the lid to wake up the system. To adjust the time for sleep delay, see "Sleep Delay" on page 28.

Upgrading the System and Transducer Software

As described in "About the System Software" on page 3, software upgrades are provided on CompactFlash cards, which are installed in the back CompactFlash slot on the right hand side of the system. Upgrades provided may be required or optional.

Whenever you install a CompactFlash card containing a newer version of software into the system, the system will determine the level of software, prepare the system for the upgrade, and then install the new software onto the system.

When a CompactFlash card contains new transducer software and the transducer that requires a software upgrade is connected, the system prompts the user that the transducer requires the upgrade.

Upgrade System Software

1   Remove any transducer or Triple Transducer Connect from the system.

2   Connect the system directly to the power supply or through the MDS/mini-dock. See the SonoSite accessories user guide.

3   Insert the CompactFlash card into the back slot.

The system displays the following message:

Figure 4.3 Upgrade System Software

4   Select **Yes** to accept or **No** to cancel the upgrade.

When you accept the system software upgrade, the system begins to load the new software and prepare for the upgrade and displays the following message:

Figure 4.4 System Software Loading

When the software upgrade has prepared the system for upgrade, the system displays the following message:

Figure 4.5 System Software Step 1 Restart

5   Select **Restart**.

After restart, there is a short delay before the system goes into the upgrade process. Do not turn the system off. The system displays the following message:
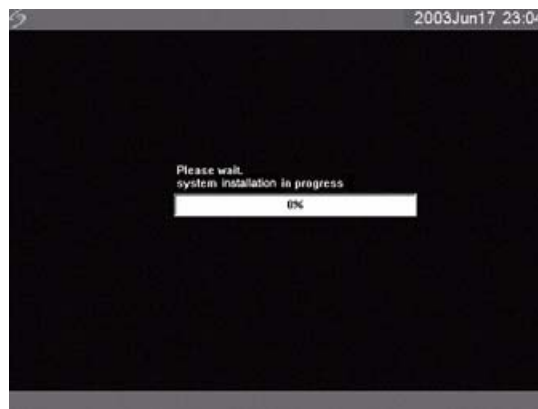

Figure 4.6 System Software Installation

When the upgrade is completed, the system displays the following message:

Figure 4.7 System Software Step 2 Restart

6   Select **Restart**.

When the operating software has been replaced, the system presents you with the license update screen so that you may license the software. If upgrading a transducer, press Cancel from the on-screen menu.
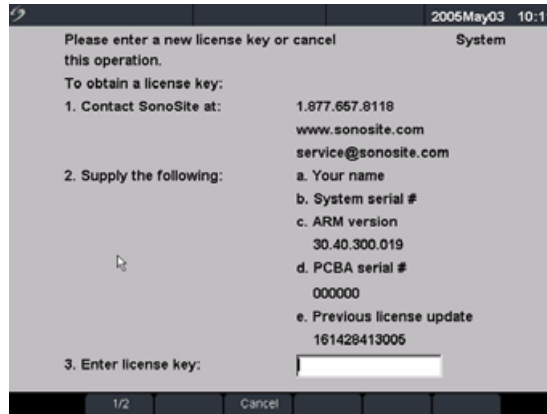
Figure 4.8 System Software License Key

At this point, the software upgrade process is complete, but the software is not yet licensed. See"Obtaining a License Key" on page 46.

Note: If you are upgrading a system and one or more transducers, it is recommended to upgrade all items before calling SonoSite Technical Support for your license keys. To postpone obtaining a license key, press Cancel from the on-screen menu.

Upgrade Transducer Software

1   Turn the system off and remove the CompactFlash card from the back slot.
2   Connect the transducer for the upgrade.
3   Turn the system on.
4   Wait approximately 10 seconds and then insert the upgrade CompactFlash card.

Note: XXX identifies the current software version.

Figure 4.9 Incompatible Transducer Update

This screen is not displayed for compatible transducers.

Figure 4.10 Upgrade Transducer Software

5   Select **Upgrade** to accept or **Cancel** to cancel the upgrade.

When you accept the transducer software upgrade, the system loads the new software and displays the following message:
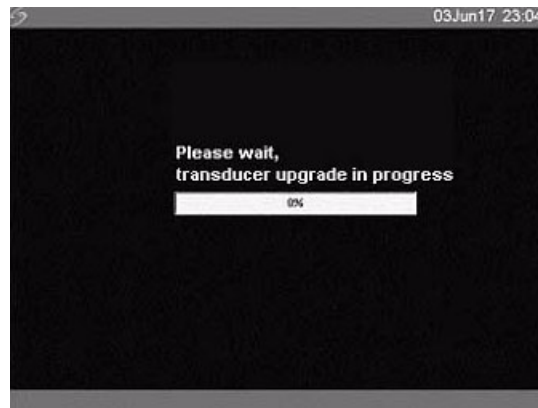

Figure 4.11 Transducer Software Loading

When the upgrade is completed, the system displays the following message.

Figure 4.12 Transducer Software Installation

6   Select **Restart**.

When the transducer software has been replaced, the system presents you with the license update screen so that you may license the software for your transducer. Upgrade all transducers before obtaining license keys. Repeat all steps in "Upgrade Transducer Software".
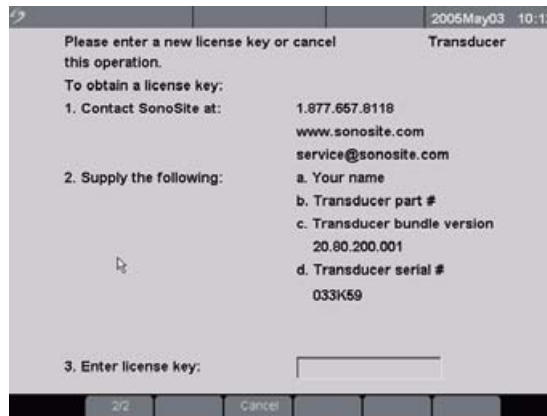
Figure 4.13 Transducer License Screen

At this point, the software upgrade process is complete, but the software is not yet licensed. The following section "Obtaining a License Key" explains how to license your system and transducer software.

Note: If you are upgrading additional transducers, it is recommended to upgrade all items before calling SonoSite Technical Support for your license keys. To postpone obtaining a license key, press Cancel from the on-screen menu.

Upgrading Triple Transducer Connect (TTC)

Upgrade TTC If the TTC requires an upgrade for the MicroMaxx system, the following message is displayed: "Do you want to upgrade the Triple Transducer Connect now?" If this message is displayed, perform the upgrade.

Select Yes to accept and No to cancel the upgrade.

- If you select Yes, the system presents you with the license update screen so that you may license the software. See "Obtaining a License Key" on page 46 to license your software.
- If you select No, the system restarts.

Obtaining a License Key

A license key is required to update your system. It may be obtained by contacting SonoSite, Inc. Technical Support Department.

Technical Support (USA, Canada)	1-877-657-8118
Technical Support fax:	1-425-951-6700
Technical Support e-mail:	service@sonosite.com
SonoSite website:	**www.sonosite.com** and select Support
International Technical Support:	Contact your local representative or call (USA) +425-951-1330
European Service Center	+44-(0)1462-444-800 e-mail: uk.service@sonosite.com
Japan Service Center	+81-3-5304-5337 e-mail: sonositejapan@sonosite.com

To receive your license key, you will need to provide the following information, which is displayed on the system information screen of your system:

Table 4.4: Software License Key Information

System Software	Transducer Software
Name of the person installing the upgrade	Name of the person installing the upgrade
Serial number (located on the bottom of your system)	Serial number
ARM version	REF number
PCBA serial number	SH database version

Installing a License Key

When you have obtained a license key for your software, you must enter it into the system. Once a valid license key has been entered, the system remains licensed until the next time the system software is upgraded.

Install License Key

1   Turn on the system.
    If the software is not yet licensed, the license update screen displays.
    The license update screen displays the following information: how to contact SonoSite, the required information to obtain the license key, and the grace period (time remaining) on your system.
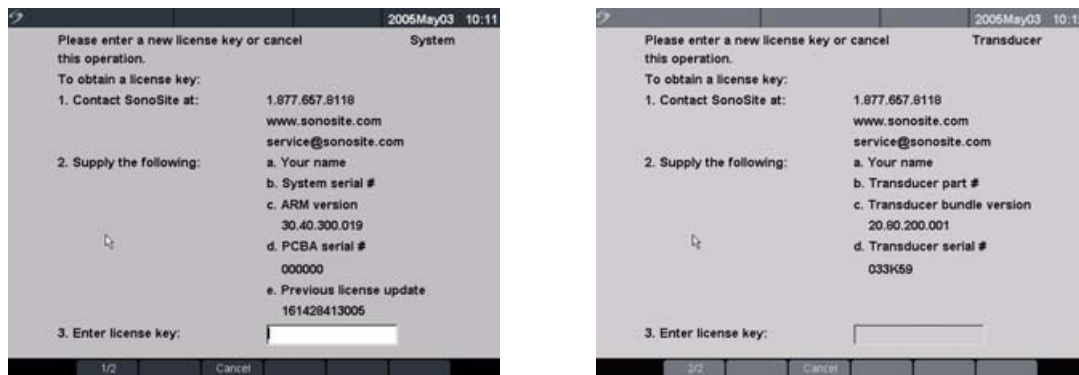

Figure 4.14 System and Transducer License Screens

2   Enter your license key in the license number field.

3   Select Done from the on-screen menu to install the license key and license your software.

Note: If you have entered a valid license key and you cannot complete the licensing procedure, verify that the license key has been entered correctly. The license key should be exactly 12 digits (for example, 123348990552) with no other characters or punctuation.

*Note: If after confirming correct entry of the license key, you are still unable to license your system, call SonoSite technical support. USA/Canada customers call **1-877-657-8118**. International customers call your local representative or **1-425-951-1330**.*

To Display the System Information Screen

Display System Information Screen

1. Press the **Setup** key.
2. Select System Information from the on-screen menu.

The system information screen displays the following information: Product, Modes, Previous License Update, Boot Version, ARM Version, DSP Version, PCBA Serial Number, PLD, CPLD Version, SH Database Version, and SH Serial Number.

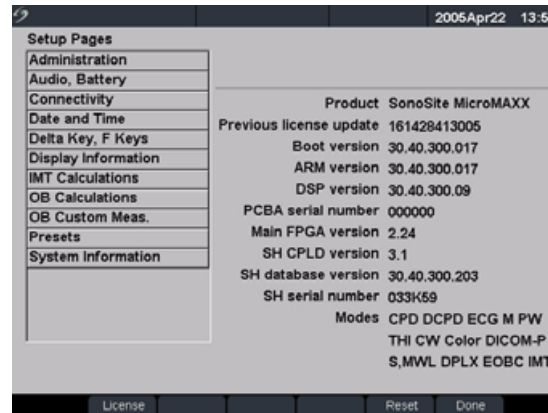*Note: The software versions on your system may vary based on your upgrade and configuration.*

Figure 4.15 System Information Screen

To Display the License Update Screen

Display License Update Screen

1. Press the **Setup** key.
2. Select System Information from the on-screen menu.
3. On the lower section of system information screen, select the button under License.

   The license update screen displays.
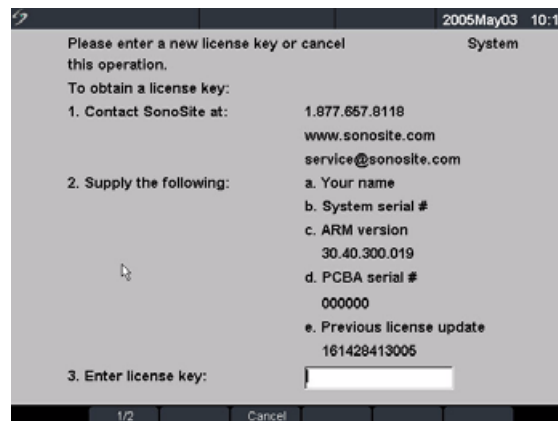4. Perform the steps in "Installing a License Key" on page 47.

Figure 4.16 Setup Screen: License Key

Chapter 5: Cleaning and Disinfecting

Universal Precautions

SonoSite recommends that personnel who have regular exposure to medical devices returned for service practice "universal precautions." Universal precautions are an approach to infection control. Those servicing this product should follow the prescribed standards for their area.

Receipt of Suspected Contaminated Materials

SonoSite recommends that personnel who have regular exposure to medical devices returned for service practice "universal precautions." Universal precautions are an approach to infection control. Those servicing this product should follow the prescribed standards for their area.

If visual inspection suggests possible contamination when opening a product returned for service, take proper steps to contain the contamination. Wear necessary Personal Protective Equipment (PPE) (gloves, masks, and gowns) when opening or examining a suspect package.

Before transfer to a service area, label the suspect package "contaminated" and seal it to prevent exposure.

Discard any packing materials removed from a package suspected of contamination in a biohazard container.

Discard any contaminated materials received with the product in an appropriate biohazard container. Contaminated materials may include biohazardous waste and sharps.

Maintain a disinfecting agent in case any work surface is contaminated. The recommended agent is 0.5% sodium hypochlorite (bleach) solution. To prepare the agent, mix one part household bleach (5.25% - 6% sodium hypochlorite) to nine parts water. Spray or wipe the solution onto the work surface and allow to air dry.

Please use these recommendations when cleaning or disinfecting your ultrasound system, transducers, and accessories. This chapter assists in effective cleaning and disinfection, but it is also intended to protect the system and transducers against damage during cleaning or disinfection.

For more information about cleaning or disinfecting solutions or ultrasound gels for the transducer, call SonoSite technical support or your local representative. For information about a specific product, call the product manufacturer.

Recommended Disinfectants

For a list of disinfectants recommended for use on the system and transducers, see the *MicroMaxx Ultrasound System User Guide*.

Chapter 6: Troubleshooting

Basic Troubleshooting

This chapter contains information to help you correct problems with system operation and provides instructions on the proper care of the system, transducer, and accessories.

If you encounter difficulty with the system, use the information in this chapter to help correct the problem. If the problem is not covered here, contact SonoSite technical support at the following numbers or addresses:

Technical Support (USA, Canada)	1-877-657-8118
Technical Support fax:	1-425-951-6700
Technical Support e-mail:	service@sonosite.com
SonoSite website:	**www.sonosite.com** and select Support
International Technical Support:	Contact your local representative or call (USA) +425-951-1330
European Service Center	+44-(0)1462-444-800 e-mail: uk.service@sonosite.com
Japan Service Center	+81-3-5304-5337 e-mail: sonositejapan@sonosite.com

Table 6.1: Troubleshooting

Symptom	Solution
System will not power on.	Check all power connections. Perform the following sequence: remove DC input connector and battery; wait 10 seconds; connect DC input or install battery; press the power key. Ensure the battery is charged.
System image quality is poor.	Adjust the LCD screen to improve viewing angle. Adjust the brightness, as necessary, to improve image quality. Adjust the gain.
No CPD image.	Adjust the gain.
No Color image.	Adjust the gain or the scale.
No OB measurement selections.	Select the OB exam type.
Print does not work.	Set the correct printer in system setup. Check the printer connections. Check the printer to ensure that it is turned on and set up properly. See the printer manufacturer's instructions, if necessary.
DVD/VCR does not record.	Check the DVD/VCR connections. Check the DVD/VCR to ensure that it is turned on and set up properly. See applicable SonoSite accessory user guide and the manufacturers' instructions, if necessary.
External monitor does not work.	Check the monitor connections. Check the monitor to ensure that it is turned on and set up properly. See the monitor manufacturers' instructions, if necessary.

Symptom	Solution
Unexpected labels using the function keys.	Ensure labels have been assigned to the function keys.
Inaccurate fetal age calculation.	Ensure that the patient information, date, and time are set accurately.
System does not recognize the transducer.	Disconnect and reconnect the transducer.
Text cursor does not move when touchpad or arrows are selected.	Text cursor is constrained to one line.
A maintenance icon ▨ displays on the system screen.	This icon indicates that system maintenance may be required. Record the number in parentheses on the C: line and contact SonoSite or your SonoSite representative.

Periodic Maintenance

There is no recommended periodic or preventive maintenance required for the system, transducers, or accessories. There are no internal adjustments or alignments required. There are no functions that require periodic testing or calibration. Performance tests are described in Chapter 8, "Performance Testing" of this manual. Performing maintenance activities not described in this manual may void the product warranty.

Local regulations may require electrical safety testing.

Contact SonoSite Technical Support for any maintenance questions.

System and Subsystem Diagnosis

This section covers basic diagnostic and troubleshooting procedures you may follow if the system does not operate properly. To diagnose system failures, consult the referenced diagnostic figures that follow or the SonoSite Technical Support department.

Table 6.2: Troubleshooting Subassemblies and Diagnostic Figures

Subassemblies	Diagnostic Figures or Table
Display	Figure 6.2
Control Panel	Figure 6.3
System	Figure 6.4
Battery	Figure 6.5
DICOM	Table 6.3

System Repair

The system is repairable through subassembly replacement or through replacement of parts as recommended by SonoSite in Chapter 7, "Replacement Procedures" of this manual. Component level repair of Printed Circuit Board Assemblies is performed only at the SonoSite repair facility. Replacement of board level components by unauthorized service facilities voids the SonoSite warranty.

Test Equipment

Test equipment is not required for this troubleshooting section. Troubleshooting test aids include an external monitor and a spare battery.

Failure (Assert) Codes

The system displays an "assert screen" for hardware and software issues related to main PCBA failures. Main PCBA failures typically result in "assert codes" that are output to the display. If an assert screen should display, note the assert code and contact SonoSite technical support to clarify the failure. Figure 6.1 shows an assert screen as displayed on the system display. The assert code is the bracketed number on the line labeled "C:".

Follow the System Flow Diagram (Figure 6.4) to evaluate the cause of failure.
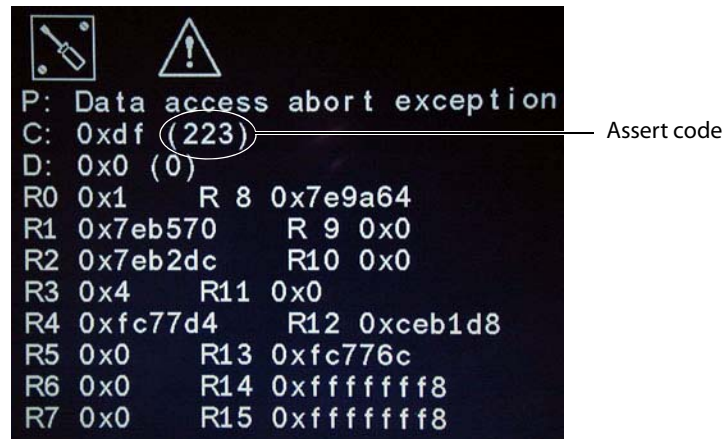

Figure 6.1 Assert Screen

Verifying a System Assert Code

System asserts are caused by hardware and/or software faults. Hardware asserts typically require main PCBA replacement. Software asserts can be reset and the system may recover. A simple method to identify the cause of the assert is identified here:

Assert Cause
1. Record the assert code.
2. Press the **Power** button and release it to power the system down.
3. Press the **Power** button again to power on the system.
   - If the system powers or normally it has recovered from the fault (software assert) and you may use the system.
   - If the assert condition remains, corrective action must be taken, usually replacement of the main PCBA is required. Contact SonoSite Technical Support for assistance and to obtain repair parts.
4. If the **Power** button is not functional, all sources of power must be removed to allow the system to power down i.e., disconnect AC power and remove the battery.
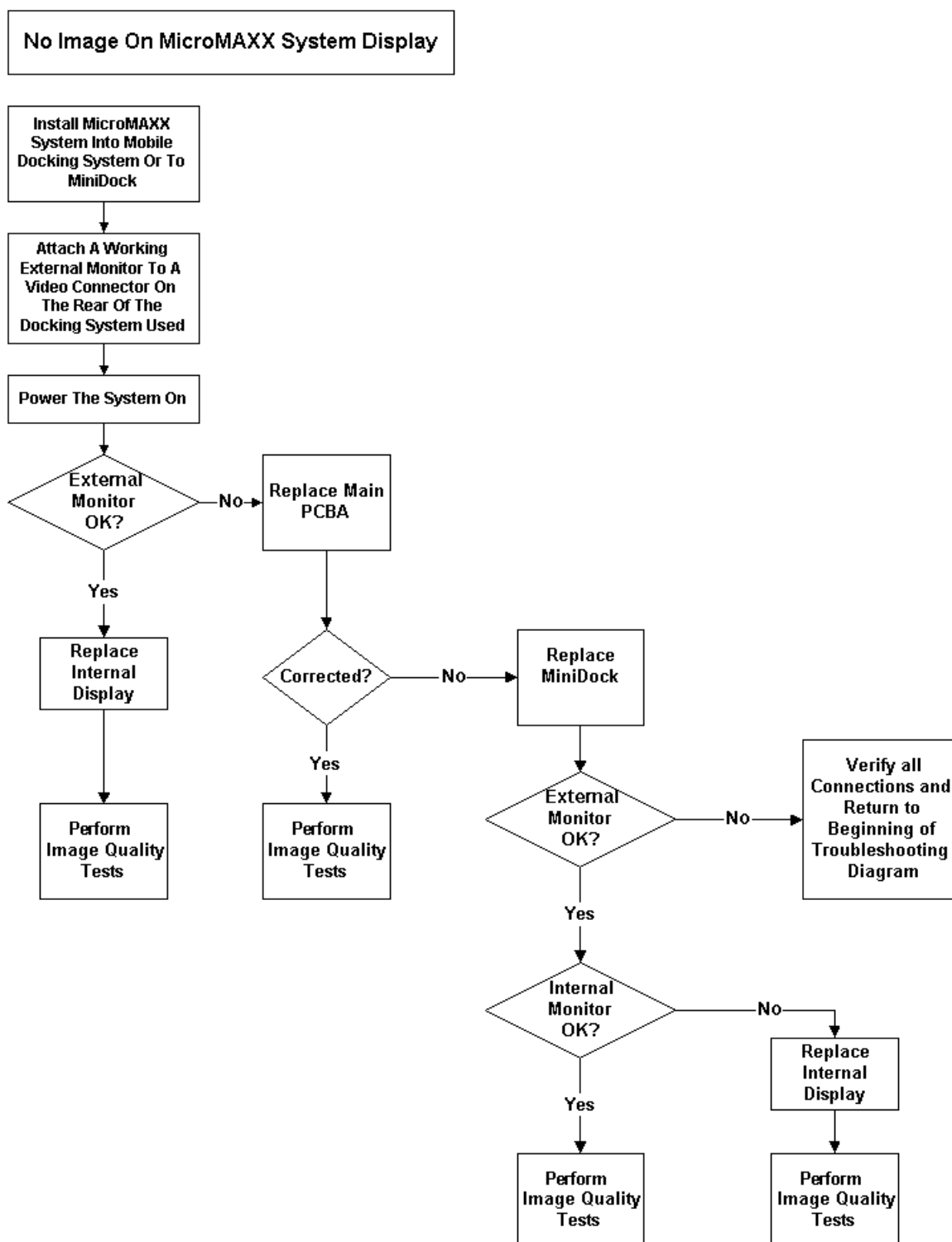
Troubleshooting Flow Diagrams

Display

Figure 6.2 Display Flow Diagram

Control Panel

MicroMAXX Control Panel Has A Failure

LED Burned Out?
Key Not Working? No Gain
Control? Touchpad Not
Responding?

↓

Replace
Control Panel

↓

Corrected? —No→ Replace Compression Connector, Main PCBA to Control Panel

Yes ↓

Perform Verification Tests for Control Panel

Corrected? —No→ Replace Main PCBA

Yes ↓

Perform Verification Tests for Control Panel

Corrected? —No→ Contact SonoSite Technical Support

Yes ↓

Perform Verification Tests for Control Panel

Figure 6.3 Control Panel Flow Diagram

System

MicroMAXX System Has A Power-On Failure

No Indication Of Power When You Press The ON Button? → Listen For A Single Beep, Look For A Video Display.

Remove the System from the Docking System and Power-On the System with the Battery

Working? —Yes→ Install the System in the Docking System with AC Adapter Attached and Power-On Again → Working? —Yes→ Perform Verification Tests in Chapter 8

No (from first Working?)

Battery Charged? —No→ Charge or Replace Battery

No (from second Working?) ↓ Replace AC Adapter

Yes (from Battery Charged?)

Working? —Yes→ Install the System in the Docking System with AC Adapter Attached and Power-On Again

No (from third Working?) ↓ Replace Main PCB

Working? —Yes→ Perform Verification Tests in Chapter 8

No (from fourth Working?) ↓ Replace Main PCB

Corrected? —Yes→ Perform Image Quality Tests In Ch 8 And Verify AC Power Operation

Corrected? —Yes→ Perform Image Quality Tests In Ch 8 And Verify AC Power Operation

No → Contact SonoSite Technical Support

No → Contact SonoSite Technical Support

Figure 6.4 System Flow Diagram

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Battery

No Power When the On Button is Pressed

No Indication of Power When You Press the ON Button?

Did You Hear A Beep When You Pressed the Power Button? Is There A Video Display? —Yes→ Perform Verification Tests in Ch 8

No

Is Battery Fully Inserted? —Yes→ First Remove Battery And Then Connect AC Power → Working? —Yes→ Replace Battery and Try Again

No (from Is Battery Fully Inserted?)

No (from Working?) → Go To Titan System Diagram

Insert Battery and Try Power Again

Working? —Yes→ Perform Verification Tests in Ch 8

No

Charge or Replace Battery

Working? —Yes→ Perform Verification Tests in Ch 8

No

Go To MicroMAXX System Diagram

Figure 6.5 Battery Flow Diagram

DICOM

Table 6.3: DICOM Troubleshooting

Error Message	Tiller Error Code	Cause	Troubleshooting
Socket communication failed	TSOCKET_CONNECT_FAILURE	Invalid network configuration. Wrong port number. Application is not running. Printer is offline.	1 Using Ping, verify that the Printer/Archiver is connected. If Ping fails: a) Check the devices IP address b) Check the MicroMaxx IP address, Subnet mask, and Gateway IP address. If Ping is OK: 2 Using Verify, check to see if device is available. If Verify fails: a) Check the Printer/Archiver's Port configuration on the MicroMaxx. b) Ensure that the Printer is online and the Archiver's application is running.
Archiver transaction failed	TDICARCH_OPEN_FAILURE	Wrong Capture Type Selected	Verify that the Archiver supports the selected Capture Type setting. E.g. US Image, SC Image or US-Ret Image.
Printer transaction failed	TDICPRNT_OPEN_FAILURE	Wrong Image Setting	Verify that the Printer supports the selected Image settings. E.g. Color (RGB) or Grayscale (Monochrome)
DICOM network communication failed	TDNETWORK_OPEN_FAILURE	Device does not recognize MicroMaxx, rejects association	Verify that MicroMaxx AE Title or IP address has been correctly configured on the Printer/Archiver. *Note: Some devices require that the Imaging modality (MicroMaxx) be recognized in order to accept images. This requires configuration on the device.*
Internal failure detected	TDNETWORK_READ_FAILURE	Invalid DICOM Attribute	Check MicroMaxx Printer DICOM settings for correctness (e.g. film size, format, etc.)

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Chapter 7: Replacement Procedures

Display Replacement

Note: Consult Chapter 6, "Troubleshooting" before making any repairs.

Required Parts

Service Assembly, Display, MicroMaxx (P05463)

Required Tools

- #1 Phillips screwdriver
- Torque screwdriver, 2.0–10.0 inch pounds (0.23–1.1 newton meter)
- 8 mm nut driver
- An anti-static mat
- A wrist grounding strap

| **Caution:** | Always use correct ESD procedures. ESD damage is cumulative and may not be noticeable at first. Initial ESD symptoms may be slightly degraded performance or image quality. |

Display Removal

Display Removal
1   Remove the battery from the system. See Section , "Installing and Removing the Battery," on page 38 for battery removal.
2   Remove the two screws from the back of the system per Figure .
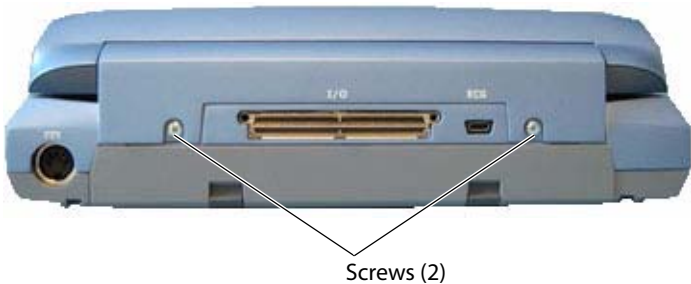
Screws (2)

Figure 7.1 System Rear

3   Lay the system on the top and remove the two screws from the bottom of the system per Figure .

Screws (2)

Figure 7.2 System Bottom

    4   Turn the system over, fully open the display, and lift off the Control Panel per Figure .
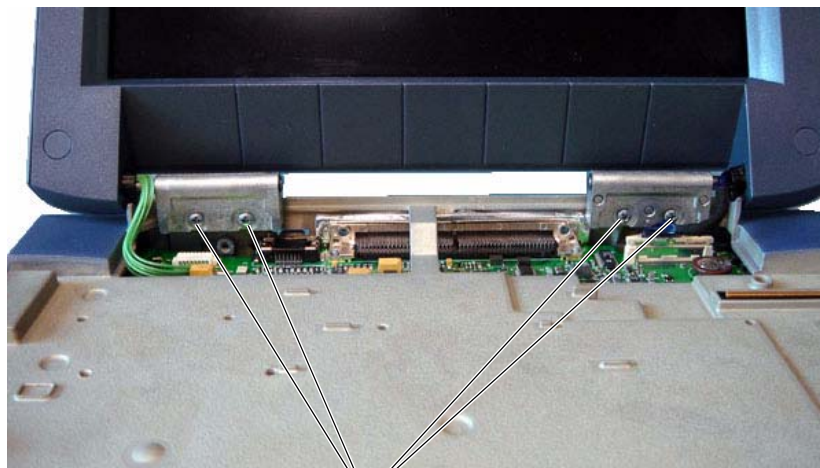

Figure 7.3 Control Panel Removal

    5   Disconnect the two connectors from the display to the Main PCBA per Figure .

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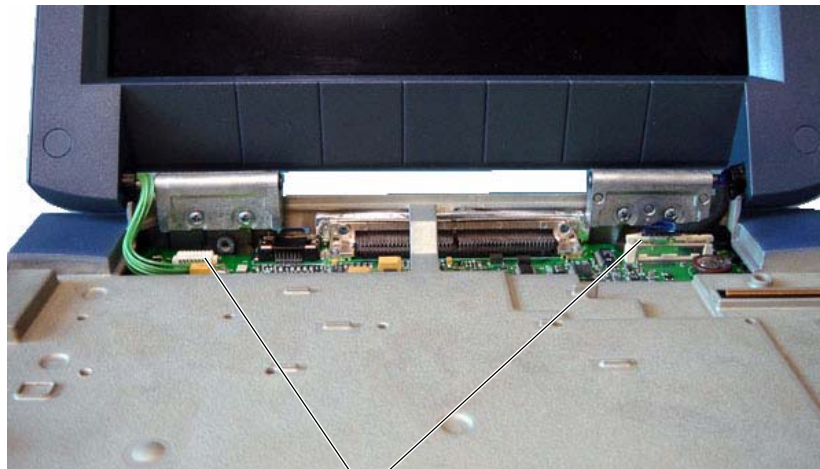
Connectors (2)

Figure 7.4 Display Connectors

6   Remove the four screws from the Display Hinges per Figure 7.5.

Screws (4)

Figure 7.5 Display Screws

Display Replacement

Display Replacement

1   Set the new display in place.

2   Install the four screws that hold the Display in place. Torque the screws to 5.5 inch pounds.

3   Connect the two connectors that connect the Display to the Main PCBA.

4   Place the Control Panel in place.

5   Reinstall the four screws that hold the Control Panel in place. Torque the screws to 5.5 inch pounds.

Test the Display

Test Display	1	Replace the battery, attach an external power supply, or attach a mini-dock.
	2	Press the **Power** key to apply power to the system.
	3	Verify the display operates correctly.

Control Panel Subassembly Replacement

Required Parts

- P05462 Service Assembly, Control Panel MicroMaxx, English or
- P05464 Service Assembly, Control Panel MicroMaxx, English, International, or
- P05465 Service Assembly, Control Panel MicroMaxx, French, or
- P05466 Service Assembly, Control Panel MicroMaxx, German, or
- P05467 Service Assembly, Control Panel MicroMaxx, Italian, or
- P05468 Service Assembly, Control Panel MicroMaxx, Spanish, or
- P05469 Service Assembly, Control Panel MicroMaxx, Portuguese

Required Tools

- #1 Phillips screwdriver
- Torque screwdriver, 2.0–10.0 inch pounds (0.23–1.1 newton meter)
- 8 mm nut driver
- An anti-static mat
- A wrist grounding strap

Caution:	Always use correct ESD procedures. ESD damage is cumulative and may not be noticeable at first. Initial ESD symptoms may be slightly degraded performance or image quality.

Control Panel Removal

Control Panel Removal	1	Remove the two screws from the rear of the system per Figure 7.1.
	2	Remove the two screws from the bottom of the system per Figure 7.2.
	3	Turn the system over, fully open the display, and lift off the Control Panel per Figure 7.3.

Control Panel Replacement

Control Panel Replacement	1	Place the new control panel in place.
	2	Install the four screws removed in Section . Torque the screws to 5.5 inch pounds.

Main System Disassembly for Repair and/or Replacement

Required Parts

Parts for the Main System Repair could include any of the following

- P05472 Service Assembly Main PCBA, MicroMaxx
- P05471 Service Assembly Power Supply, MicroMaxx
- P05470 Service Assembly TGC, MicroMaxx
- P05473 Service Assembly Speaker, MicroMaxx
- P05474 Service Assembly Upper Enclosure, MicroMaxx
- P05475 Service Assembly Lower Enclosure, MicroMaxx

   Note: Replacing the enclosure bottom requires printing a new label for the product. This must be printed prior to shipping the enclosure bottom. You will be required to provide the information to print this label.

- Nest Frame Assembly, MicroMaxx (order these parts individually)
   - P00364 Connector, Interposer
   - P00524 Screw, Shoulder, Thrust Plate
   - P00353 Wear Plate
   - P00646 Spring, Thrust Plate
   - P02860 Nest Plate, Interposer
   - P03834 Shield, Perimeter, Long
   - P03833 Shield, Perimeter, Short
   - P02861 Post, Mounting

Required Tools

- #1 Phillips screwdriver
- Torque screwdriver, 2.0–10.0 inch pounds (0.23–1.1 newton meter)
- 8 mm nut driver
- An anti-static mat
- A wrist grounding strap

Caution: Always use correct ESD procedures. ESD damage is cumulative and may not be noticeable at first. Initial ESD symptoms may be slightly degraded performance or image quality.

Main PCBA Removal

Main PCBA Removal

1 Remove the display and the control panel from the system following the removal procedures in Section and Section .

2 Remove the additional 4 screws from the bottom of the system per Figure 7.6.

Screws (4)

Figure 7.6 Bottom Screws

3   Turn the system over and remove the top enclosure from the main PCBA. This exposes all of the replaceable parts for the main system per Figure 7.7.
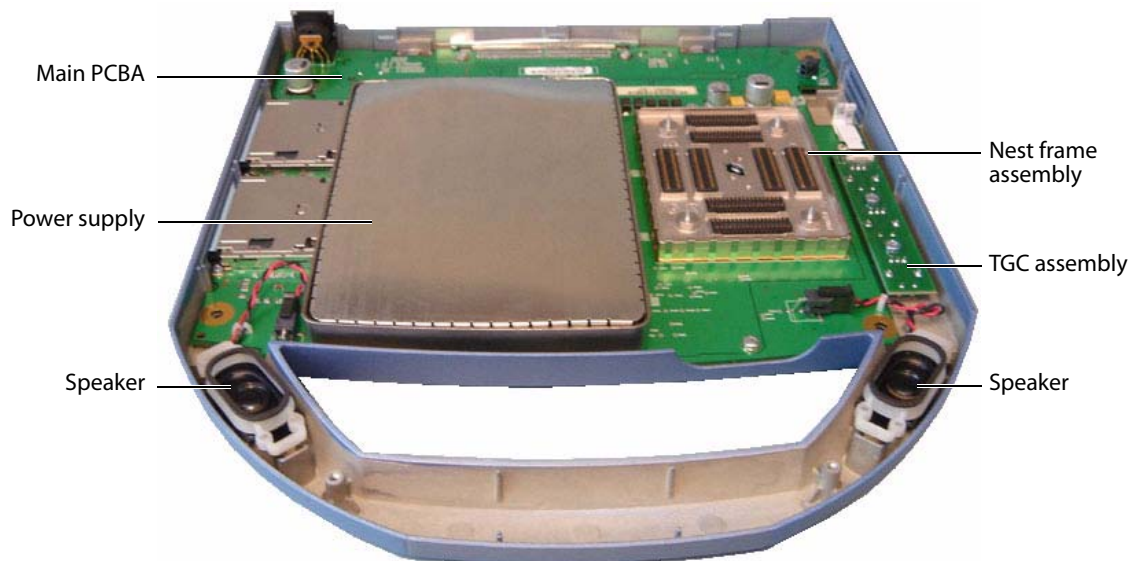

Main PCBA

Power supply

Speaker

Nest frame assembly

TGC assembly

Speaker

Figure 7.7 System Components

Speaker Replacement

Speaker Replacement	1	Press on the connector release and pull the connector out of the receptacle.
	2	Gently pry off the retaining clip with a flat bladed pry tool. See Figure 7.8.

Connector

Retaining clip
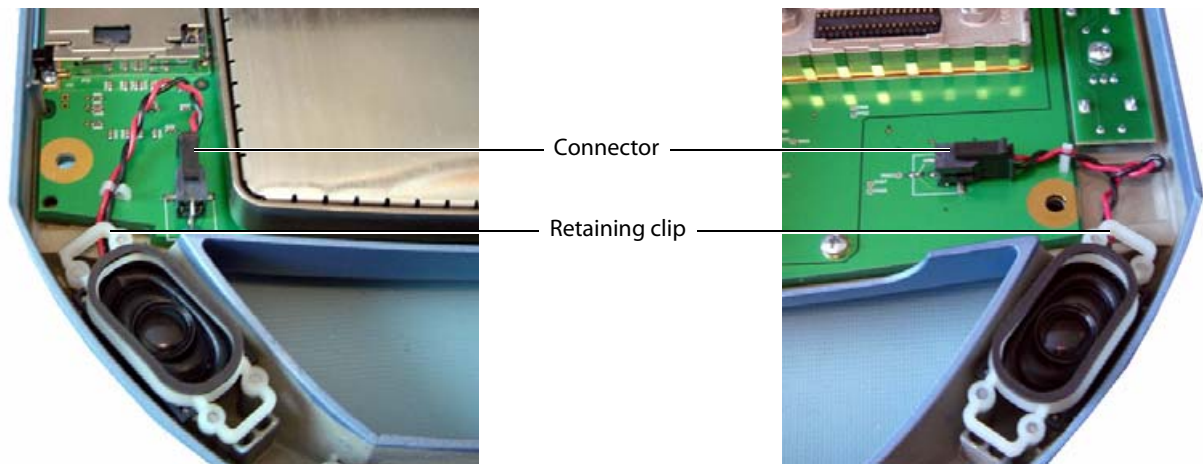
Figure 7.8 Speaker Replacement

Power Supply

Power Supply	1	Gently pry the shield from the power supply and set it aside. This part will be used in reassembly. Note that the shield fits only one way. See Figure 7.9.

Power supply shield
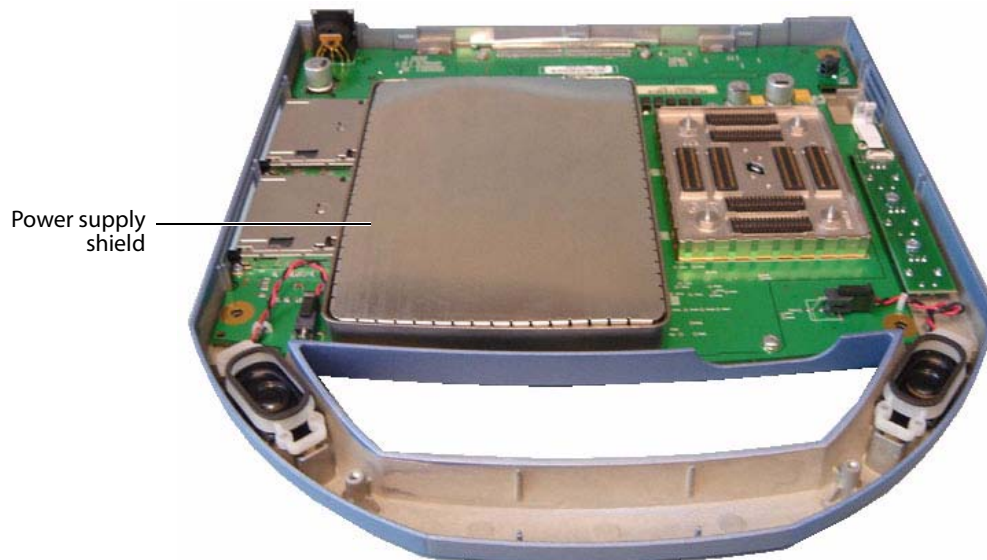
Figure 7.9 Power Supply Shield

2   Remove the 7 screws that hold down the power supply PCB per Figure 7.10.

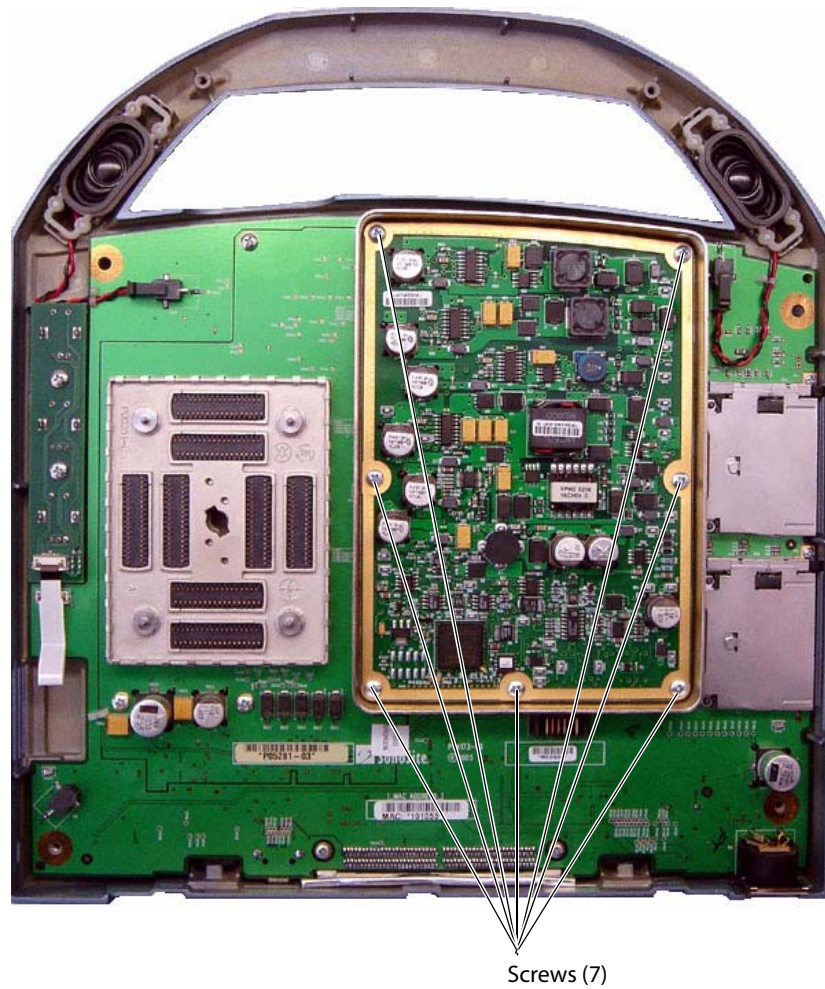3   Gently lift the power supply and shield assembly away from the Main PCBA.

Screws (7)

Figure 7.10 Power Supply Screws

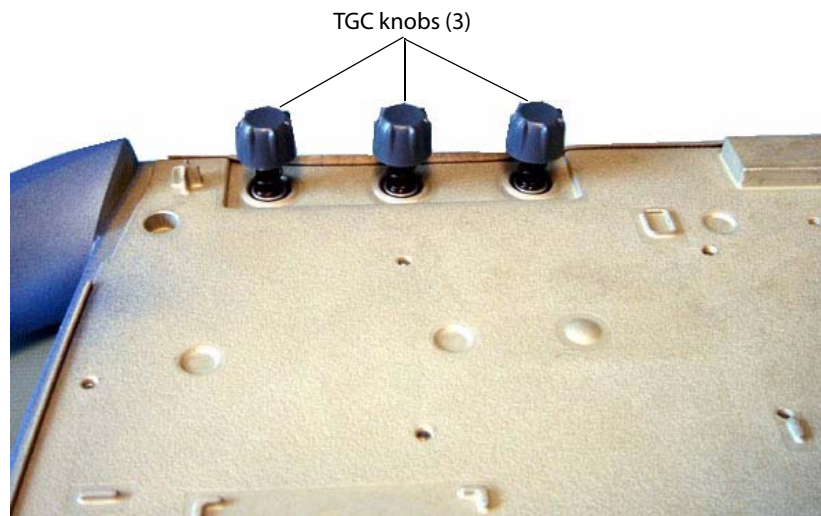| **TGC PCBA** | 1 | Remove the TGC knobs identified in Figure 7.11. |

TGC knobs (3)

Figure 7.11 TGC Knobs

2   Remove the flex cable from the TGC PCB by lifting on the flex release tab. See Figure 7.12.

3   Remove the flex cable from the Main PCBA by lifting gently on the flex release tab.
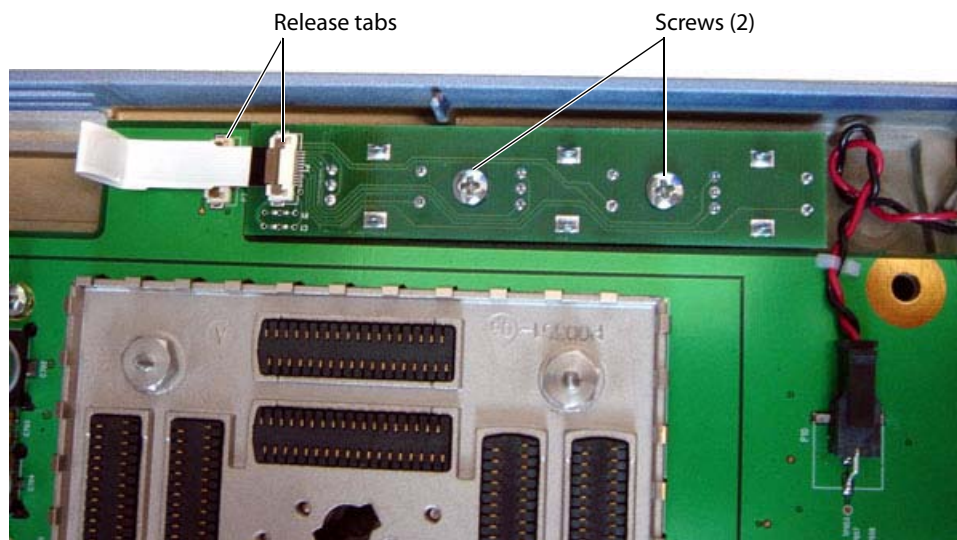
4   Remove the two screws holding the TGC PCBA in place.

Release tabs   Screws (2)

Figure 7.12 TGC Removal

Main PCBA

Main PCBA	1	Remove the 3 screws holding the Main PCBA in place per Figure 7.13.
	2	Remove the 4 shoulder bolts holding the transducer nest frame assembly in place. As you remove the nest frame assembly from the PCBA tilt the PCBA and enclosure to almost vertical to avoid spilling the Interposer Connectors from the Assembly.
	3	Remove the 2 screws located on the CompactFlash assemblies.
	4	Disconnect the speaker wires from the Main PCBA.
	5	Remove the TGC PCBA following the procedure in Section .

Figure 7.13 Main PCBA Screws

6   Lift on the edge of the Main PCBA closest to the system handle.

Note: As the Main PCBA is removed press in on the CompactFlash release buttons so they clear the opening in the bottom enclosure.

Main PCBA Replacement

Main PCBA Replacement	Replace the Main PCBA by following the reverse of the removal procedure. Do not tighten all the screws until everything is in place.

1   Replace the Main PCBA.

2   Replace the Nest Frame Assembly.

3   Reconnect the speaker wires.

4   Replace the power supply assembly.

5   Replace the TGC assembly.

6   Reinstall the shield to the Power Supply.

7   Tighten all screws to their specified torque of 5.5 inch pounds.

Chapter 8: Performance Testing

Overview

WARNING:	**Critical Test Function** — A failure of the system functions tested in this section could affect safety or effectiveness of the system adversely. While performing the steps in this section, verify that the images on the system display and on the external monitor are acceptable.

- Verify that all controls operate smoothly over their full range and that the system responds properly.
- To obtain 2D images, SonoSite recommends using the RMI 413A Soft Tissue Phantom or the RMI 403 GS Multipurpose Phantom. Any equivalent Phantom is acceptable.
- To obtain Power Doppler images, SonoSite recommends using the RMI 425 Doppler Phantom or the RMI 1425A Doppler Phantom. Any equivalent Phantom is acceptable.
- When making penetration measurements on a phantom, apply the phantom reference value and tolerance to the measurement.

Test Equipment

- SonoSite ultrasound system under test
- C60e/5-2 MHz transducer
- P17/5-1 MHz transducer
- RMI 413A Soft Tissue Phantom, RMI 403 GS Multipurpose Phantom, or the equivalent
- RMI 425 Doppler Phantom, RMI 1425A Doppler Phantom, or the equivalent
- Video Printer
- External Monitor
- Acoustic gel

Setting Up Performance Tests

Set up Performance Tests	1	Attach the C60e/5-2 MHz transducer to the system.
	2	Select general for optimization and OB for exam type.
	3	Couple the transducer to the phantom, adjusting gain settings and transducer for a proper phantom image (e.g., pins are high-level echoes positioned in straight lines; cysts are sonolucent, edges are sharp, and graphite particles of the phantom are mid-grays).

Scan Reference Orientation

Set up Scan Reference Orientation	1	Verify that the correct transducer name appears in the upper right corner of the system display.
	2	Verify that the scan plane orientation mark in the image located near the skinline corresponds to element #1 on the transducer. To test, put your finger on the probe and run it across the transducer face. Your finger touching the transducer face should appear at the orientation mark on the display image format.
	3	With the array pointing down and the orientation mark to the operator's left, element #1 corresponds with the left side of the array.

Testing 2D Performance

Test 2D Performance

1. Use a C60e/5-2 MHz transducer in 2D mode.
2. Adjust the position of the C60e/5-2 MHz transducer on the phantom.
3. Use the 2D system controls to obtain a clear image that shows both the horizontal and vertical rows of pins.

2D Image Quality

Test 2D Image Quality

1. Verify that the ultrasound image appears uniform in both the axial and lateral direction, with no dropouts or intensity variations.
2. Verify that the cystic structure at the focal zone is clearly differentiated from the surrounding tissue and is echo-free, while solid tissue, with numerous echo sources, appears solid.

Axial Measurement Accuracy

Note: Measurements must be performed while the image is frozen.

Set up Axial Accuracy

1. Acquire the image.
2. Press the **Freeze** key.
3. Press the **Caliper** key. The caliper appears on the image display. The screen menu indicates Cal 1, Cal 2, and Ellipse. (If the caliper line setup is on, then a dotted line connects the two calipers. See the *MicroMaxx Ultrasound System User Guide*, if necessary.) The Cal 1 caliper is active by default.
4. Use the touchpad to position one of the calipers.
5. Press the **Select** key to fix the caliper and enable the other caliper.
6. Use the touchpad to move the other caliper. The results update as you move the caliper, and the measurement is complete when you finish moving the calipers. (Press the **Select** key to alternate the active caliper, and adjust the measurement with the touchpad.)
7. To perform another distance measurement on the image, select the other distance icon and repeat the preceding steps.

Test Axial Accuracy

1. Measure the distance, center to center, of any two pins that are 5-12 cm apart vertically.
2. Verify that the distance measured is within the tolerance listed in Table 8.1.

Lateral Measurement Accuracy

Set up Lateral Measurement Accuracy	Perform steps 1 through 7 in Section .
Test Lateral Measurement Accuracy	1 Measure the distance, center to center, of any two pins that are 4-10 cm apart horizontally. 2 Verify that the distance measured is within the tolerance listed in Table 8.1. 3 Press the **Freeze** key to return the system to live 2D mode.

Table 8.1: System Measurement Accuracy

Measurements	Tolerance
Axial Distance	+/- 2%
Lateral Distance	+/- 2%

Penetration

Test Penetration	1 Adjust the system controls to obtain a clear image that shows the limits of echo penetration as shown in Table 8.2. 2 Measure from the center of the skinline to the deepest vertical position—where the scatter echoes start to break up and tissue definition is lost.

Table 8.2: Imaging Performance

Imaging Performance	C60e	ICTe	P17	L38e	HFL38	TEE
2D Penetration	11.5 cm	5.0 cm	19.0 cm	6.0 cm	5.0 cm	18.0 cm

Additional Performance Tests

CPD

Test CPD	*Note: Use the RMI 425 Doppler Phantom or the RMI 1425A Doppler Phantom.* 1 Connect any transducer and set up the system for CPD mode. 2 Acquire the image. 3 Press and release the **Color** key for CPD mode. Select CPD from the on-screen menu. A Region of Interest (ROI) box is displayed on top of the grayscale image. (Press the **2D** key to return to 2D imaging.)
Move CPD Image	• Use the touchpad to move the CPD ROI. While you are moving the CPD ROI, you will see an outline of the new position moving on the display. When you stop moving, the new position will display the CPD ROI. (The size of the CPD ROI is fixed. There is no control to change it.)
Adjust CPD Gain	Turn gain clockwise to increase the amount of CPD gain. (While in CPD imaging, near and far affect only the 2D image; they do not affect the CPD image.) Turn gain counterclockwise to decrease the amount of CPD gain. 1 Image the vessel using a Doppler phantom. Verify that as the gain controls increase and decrease, Doppler echo intensity increases and decreases to correspond. Verify that no flow exists outside the vessel. 2 Save a CPD image by pressing the **Freeze** key and then the **Save** key.

M Mode Imaging

Test M Mode Imaging	1 Attach a C60e transducer and acquire an image. 2 Press the **M Mode** key for the M Mode sample line. 3 Position the M Mode sample line over the image using the touchpad. 4 Press the **M Mode** key again to turn on M Mode. 5 Select the desired sweep speed from the on-screen menu (slow, med, or fast). The on-screen menu will show the selected sweep speed. 6 Press the **Freeze** key to freeze the image. Press it again to return to live imaging. 7 Press the **2D** key to return to 2D imaging.

Tissue Harmonic Imaging

Test THI Imaging	1 Attach the C60e transducer and acquire an image. 2 Set the depth to maximum and note the depth at which echo information is lost. 3 Press the **THI** key on the control panel so it displays THI on the display. Tissue Harmonic Imaging in now active. 4 Observe a decrease in dot size and a significant loss in penetration due to the higher frequency. Image resolution increases. 5 Press the **THI** key again to turn off Tissue Harmonic Imaging.

Pulsed Wave (PW) Doppler Imaging

Test PW Doppler Imaging

1. Attach the C15 transducer.
2. Press the **Doppler** key for the Doppler sample gate.
3. Press the **Doppler** key again for the Doppler spectral trace.
4. Place a large drop of ultrasound gel on the transducer lens.
5. Gently tap the top of the gel and observe a reflection on the spectral trace and the sound from the speakers.
6. Press the **2D** key to return to 2D imaging.

Image Quality Verification Test/Livescan

- Products with replaced subassemblies, or products that have been otherwise disassembled, must undergo an Image Quality Verification Test/Livescan.
- The Image Quality Verification Test/Livescan should be performed after successfully completing Section , "Setting Up Performance Tests," on page 69 and Section , "CPD," on page 72.
- The test is completed before returning the system to service.
- A certified sonographer must perform the test.
- The Livescan test performed is at the discretion of the Sonographer and will represent their acceptance of a successful service event.

Image Review

Review all saved images and verify that the images are displayed properly.

Printer

Test Printer Operation

1. Print two images in rapid succession and verify proper operation.
2. Verify that the print control on the system functions correctly.

Battery Charging

Test Battery Charging Operation

1. Remove the system from the Docking System and insert a battery into the system.
2. Press the **Power** key to turn the system on. Allow the battery to discharge. The battery indicator icon on the display, below the Transducer Type indicator, will extinguish from left to right as the battery discharges.

   Note: The battery may take 1–2 hours to discharge.
3. Reattach the system to the Docking System and attach the AC power cord to the power connector.
4. Note that the battery indicator indicates that the battery is charging. The sections of the battery indicator will light sequentially from left to right as the battery charges.
5. If charging is not evident, see Chapter 6, "Troubleshooting" for troubleshooting procedures.

Video Output

Caution:	Use only the recommended video monitor, printer, or VCR when verifying the video output at the video receptacle.

Test Video Output

1 Attach an external video monitor to the video connector using the video cable.

2 Turn on the system power and verify that the video on the external monitor matches the video on the system display.

   If the video does not appear similar, or there is no display on the external monitor, see Chapter 6, "Troubleshooting" for troubleshooting procedures.

Returning Products to SonoSite

Contacting SonoSite Technical Support

Technical Support (USA, Canada)	1-877-657-8118
Technical Support fax:	1-425-951-6700
Technical Support e-mail:	service@sonosite.com
SonoSite website:	**www.sonosite.com** and select Support
International Technical Support:	Contact your local representative or call (USA) +425-951-1330
European Service Center	+44-(0)1462-444-800 e-mail: uk.service@sonosite.com
Japan Service Center	+81-3-5304-5337 e-mail: sonositejapan@sonosite.com

You will be asked to provide the following information:
- Contact name and phone number
- Product name
- Serial number
- Description of the problem

Shipping Instructions

Please contact SonoSite to get a return material authorization number (RMA). Contact SonoSite before returning any product.

The shipping address for all returned products is:

SonoSite, Inc.
Attn: Technical Support RMA _____
21919 30th Drive SE
Bothell, Washington 98021
USA

Appendix A: Parts List

This section contains a list of field-replaceable parts.

Replacement Parts List

The following tables contain all the replaceable parts for the MicroMaxx Ultrasound System. All quantities are one unless otherwise noted.

Display

Table A.1: Display

Find Number	Part Number	Description
	P05463	Service Assembly Display MicroMaxx
1	P02619	Hinge
2	P02172	Wire harness inverter
3	P02173	Wire harness display
4	P05410	Cover screw
5	P04529	Label, bezel
6	P04163	Display bezel
7	P04156	Display LCD

Table A.1: Display (Continued)

Find Number	Part Number	Description
Not shown	P02489	Clip display harness
	P04098	Enclosure, back
	P04345	Display label, 3D
	P04499	Gasket display
	P04501	Gasket display front
	P05381	Assembly, backlight inverter

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Control Panel

Table A.2: Control Panel

Part Number	Description
P05462	Service Assembly Control Panel, MicroMaxx, English
P05465	Service Assembly Control Panel, MicroMaxx, French
P05466	Service Assembly Control Panel, MicroMaxx, German
P05467	Service Assembly Control Panel, MicroMaxx, Italian
P05468	Service Assembly Control Panel, MicroMaxx, Spanish
P05469	Service Assembly Control Panel, MicroMaxx, Portuguese

Replacement Parts, System
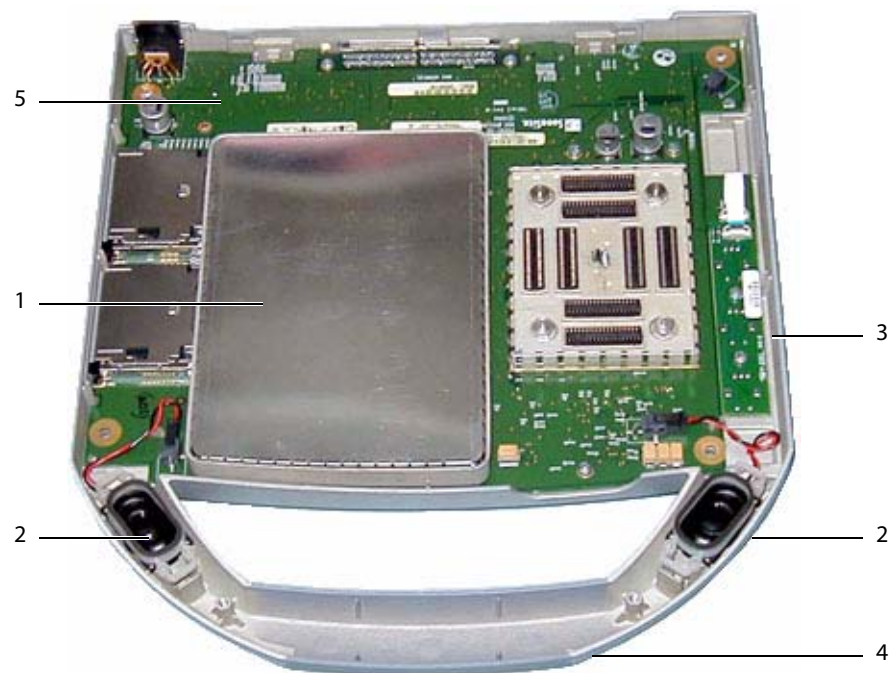
Table A.3: System

Find Number	Part Number	Description
1	P05471	Service Assembly Power Supply, MicroMaxx
2	P03872	Service Assembly Speaker, MicroMaxx
3	P05470	Service Assembly TGC, MicroMaxx
4	P05474	Service Assembly Upper Enclosure, MicroMaxx
Figure A.6 on page 82	P03874	Service Assembly Lower Enclosure, MicroMaxx *Note: This part requires printing a replacement label for the product. Contact SonoSite Technical Support when ordering this part to have the label printed and placed on the part.*
5	P05472	Service Assembly Main PCBA, MicroMaxx *Note: This part does not include the transducer nest frame assembly. Those parts must be ordered separately if needed to complete the replacement of the Main PCBA.*
6	P00361	Foot
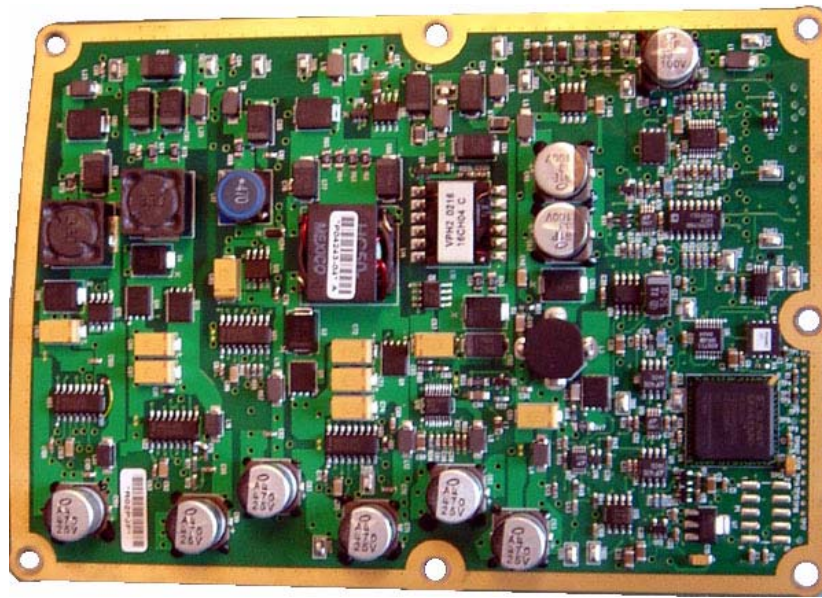
Figure A.1 Power Supply, P05471
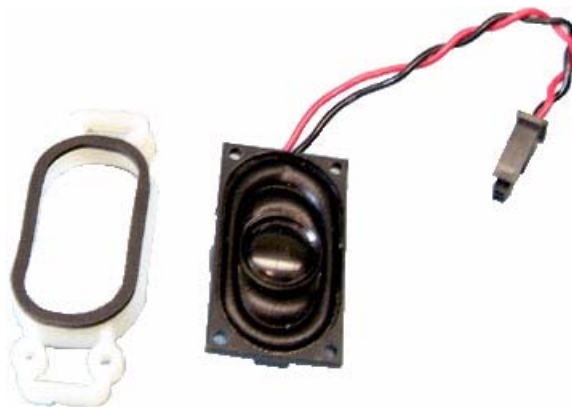
Figure A.2 Speaker Assembly, P03872
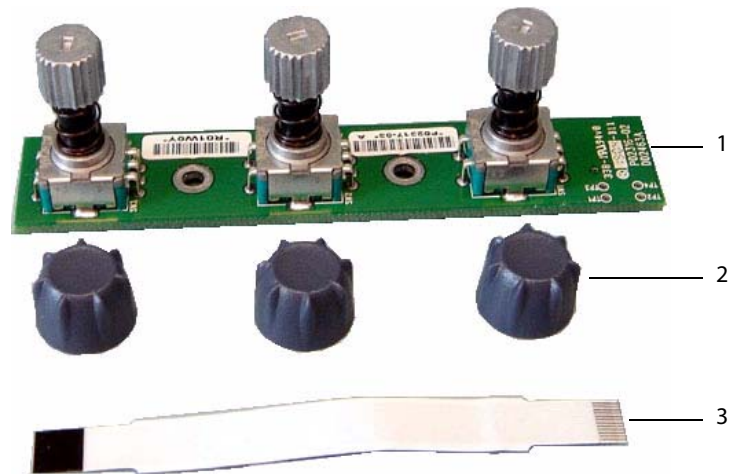
Figure A.3 TGC Assembly, P05470

Table A.4: TGC Assembly

Find Number	Part Number	Description
1	P02317	Assembly, PCB, TGC
2	P04994	Knob, TGC
3	P02308	FFC, 12 Position Jumper
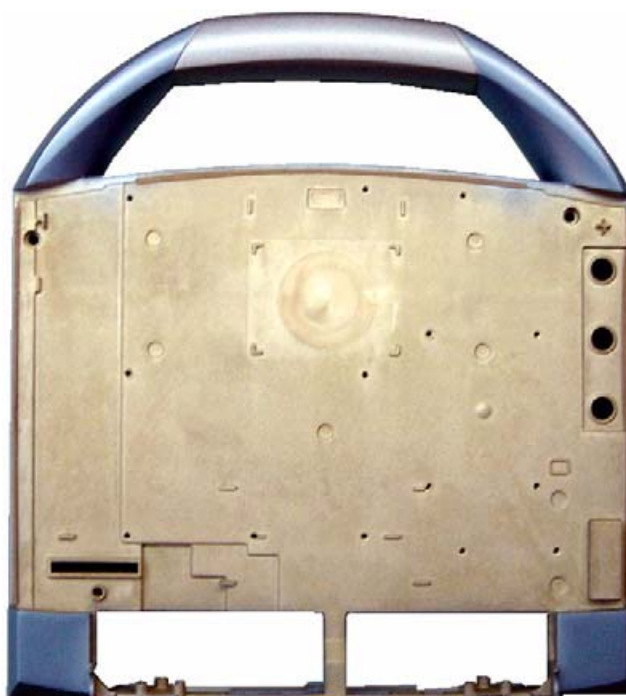
Figure A.4 Upper Enclosure, P05474 (top view)
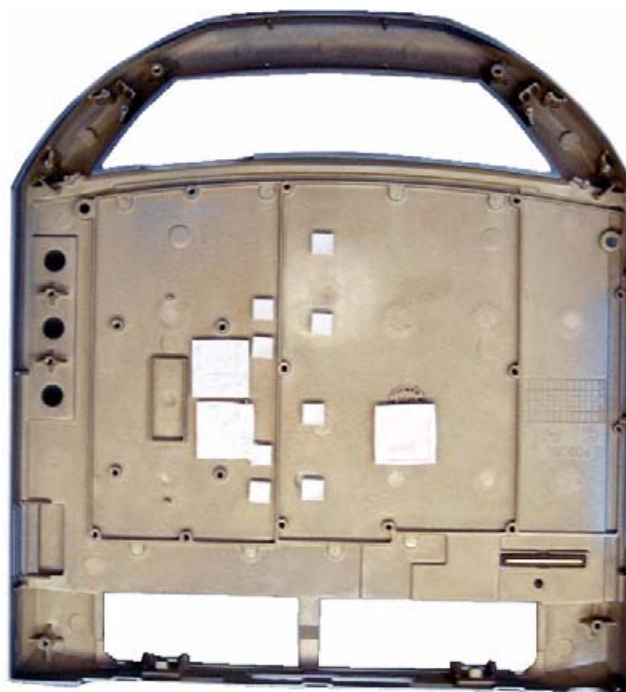
Figure A.5 Upper Enclosure Assembly, P05474 (bottom view)

Figure A.6 Lower Enclosure, P03874 (bottom view)

Figure A.7 Lower Enclosure, P03874 (top view)
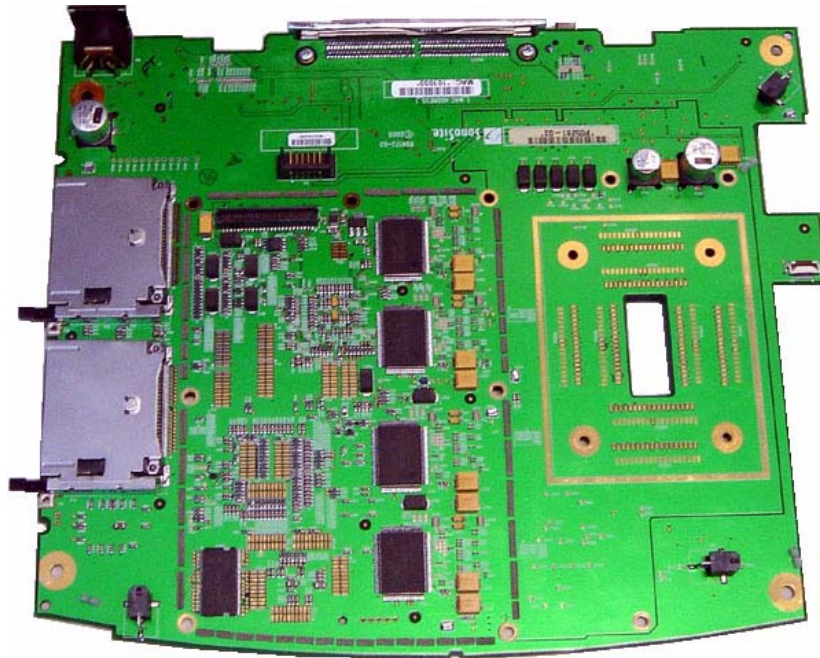
Figure A.8 Main PCB Assembly, P05472

Transducer Nest Frame Assembly
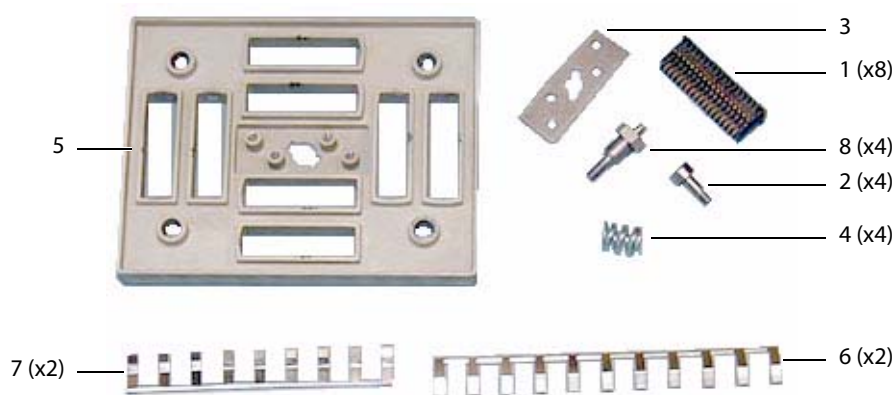
Figure A.9 Nest Frame Parts

Table A.5: Nest Frame Assembly

Find Number	Part Number	Description
1	P00364	Connector, Interposer
2	P00524	Screw, Shoulder, Thrust Plate
3	P00353	Wear Plate
4	P00646	Spring, Thrust Plate, .047 wire
5	P02860	Nest Plate, Interposer
6	P03834	Shield, Perimeter, Long
7	P03833	Shield, Perimeter, Short
8	P02861	Post, Mounting

Ordering Replacement Parts

To order parts, contact SonoSite Technical Support as indicated in Section , "Returning Products to SonoSite," on page 74.

Appendix B: Service Event Report

The Service Event Report provides information about product failures to the manufacturer and to authorized service facilities, which provide approved warranty services for SonoSite products. For all repairs completed, complete the form and return a copy of it to the following address:

SonoSite, Inc.
Technical Support
21919 30th Drive SE
Bothell, Washington 98021
USA

Technical Support (USA, Canada)	1-877-657-8118
Technical Support fax:	1-425-951-6700
Technical Support e-mail:	service@sonosite.com
SonoSite website:	**www.sonosite.com** and select Support
International Technical Support:	Contact your local representative or call (USA) +425-951-1330
European Service Center	+44-(0)1462-444-800 e-mail: uk.service@sonosite.com
Japan Service Center	+81-3-5304-5337 e-mail: sonositejapan@sonosite.com

Service Event Report
Instructions on reverse

![SonoSite logo] *Carrying Ultrasound into the Future*

For SonoSite Use Only	Service Request	
	Order Number	
	RMA Number	

Service Provider

Name:		Provider Reference:	
Company:		Date Reported:	
Address:			
Phone Number:		Fax Number:	
E-mail address:			

Device Description

Name:		Ref Number:	
Serial Number:		Lot Number:	
ARM/SHDB Version:		Configuration:	

Event Description

Diagnosis

Service Performed	Performed By:		Date:	

Parts Removed

Part Name	Part Number	Serial Number	Lot Number	Rev	Replaced By

Parts Installed

Part Name	Part Number	Serial Number	Lot Number	Rev	Replaced By

Tests Performed (attach test data)

Test:	Test:
Performed By:	Performed By:
Result: Pass ☐ Fail ☐	Result: Pass ☐ Fail ☐

Attach additional sheets as required

Page ____ of ____

F00019 Rev D

Instructions for completing the Service Event Report

The sections highlighted in yellow are the minimum that must be completed for us to accept a Service Event Report. If we need additional information, we will let you know.

Forward completed form to:
Email: service@sonosite.com
Fax: +1-425-951-6700

Service Provider
- **Name**: the name of the technician performing the work.
- **Provider Reference**: a unique number used by the Provider to track Service Event Reports. Can be in any format.
- **Company**: the name of the Dealer Company or authorized repair site.
- **Address**: the address replacement parts will be shipped to.
- **Date Reported**: the date the failure was reported to SonoSite.
- **Phone Number**: the phone number to contact the service technician.
- **Fax Number**: the fax number to contact the service technician.
- **Email Address**: the email address to contact the service technician.

Device Description:
- **Name**: the description of the failed system.
- **Ref Number**: the reference number from the part number label of the failed system.
- **Serial Number**: the serial number from the part number label of the failed system.
- **Lot Number**: if applicable, the Lot Number from the device identification label.
- **ARM/SHDB Version**: the software level of the failed device. Typically found on the system information screen.
- **Configuration**: for configurable devices, the optional features enabled. Typically found on the system information screen as MODES.

Event Description
- A description of the problem from the viewpoint of the user. Typically what the user reports to the repair facility.

Diagnosis
- A description of what the repair technician found. Include a list the suspect parts.

Service Performed
- A description of the work performed to repair the system. Typically only completed if it is repaired from stock repair parts.

Parts Removed
- **Part Name**: the name of the failed part/suspect part to be replaced.
- **Part Number**: the part number from the failed part/suspect part itself.
- **Serial Number**: the serial number from the failed part/suspect part itself.
- **Lot Number**: the lot number if available.
- **Rev**: the revision from the failed part/suspect part itself if available.
- **Replaced By**: the person replacing the part.

Parts Installed
- The same information as the Parts Removed except from the parts installed if work has already been performed. If you are waiting for parts to be ordered, leave this section blank.

Tests Performed
- The results of any testing performed, if testing has already been performed.

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